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What Modern Equipment Has Done

One of a series of articles giving the actual results achieved by replacing obsolete with up-to-date equipment

Shop No. 8

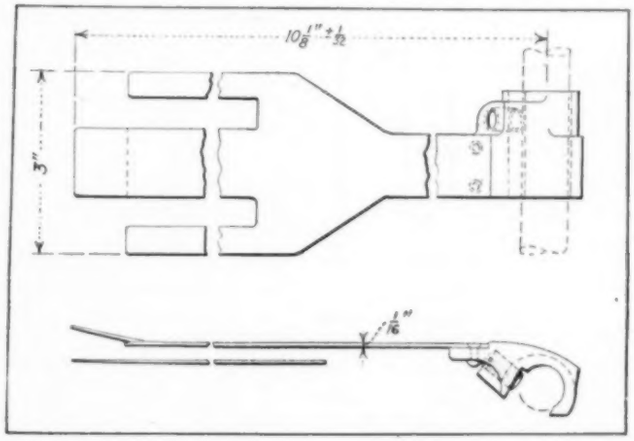
Dexter Folder Company

By Leonard Baker
Production Manager

IN MORE than doubling the output of the Dexter Folder Company's plant at Pearl River, New York, during the last eight years, while holding the number of employees constant, materially increasing the wage scale and at the same time bettering the product in a multitude of ways, the purchase of new and improved machinery has played an important part.

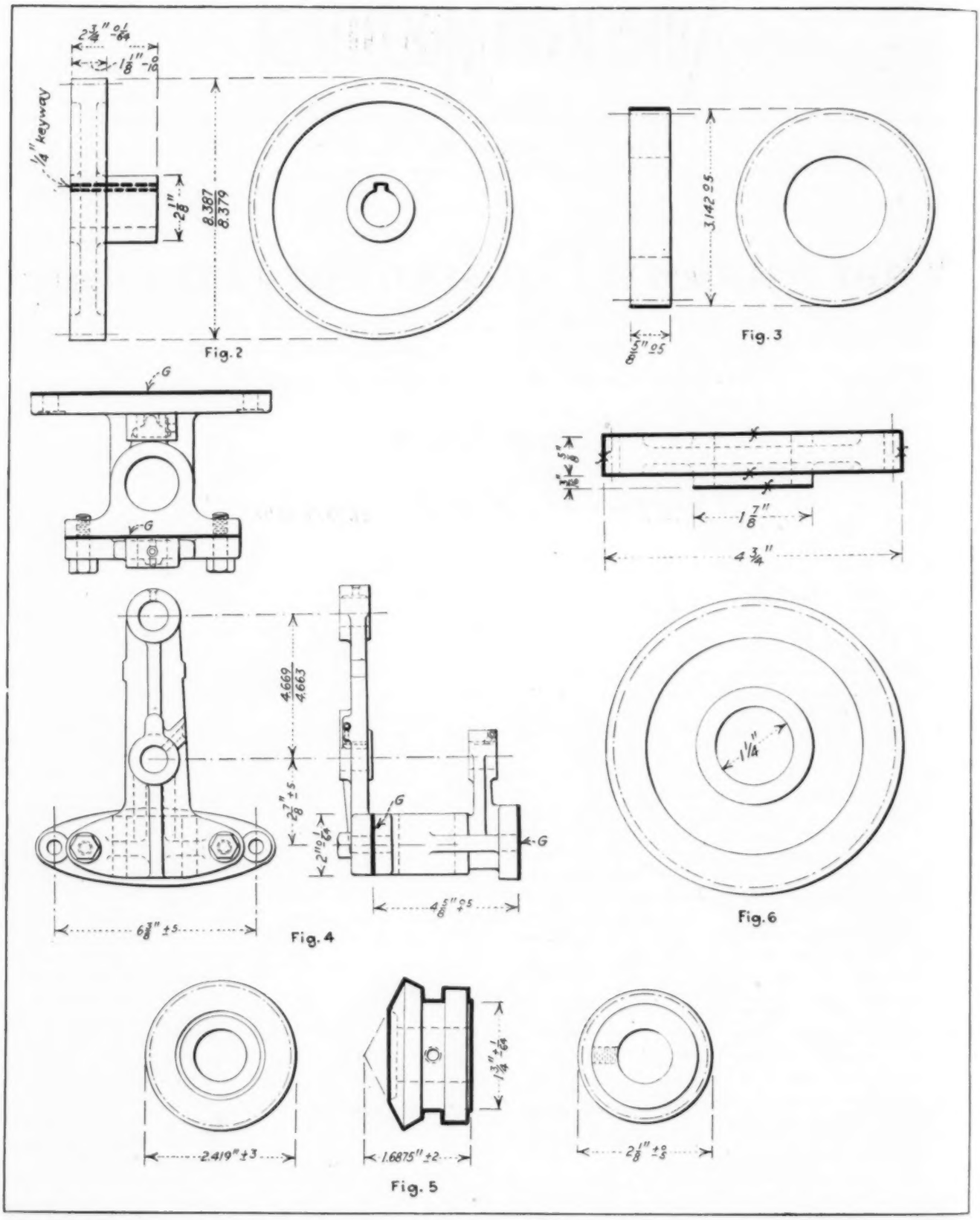
The purchase of new machinery, however, calls for serious investigation. The fact that a machine is worn out does not necessarily mean that it should be replaced by a new machine of the same general type, nor does it follow that a machine must be worn out before its usefulness is gone. It is the duty of our time-study department to analyze our production machinery continually, bearing in mind the most advanced practice that we can discover for similar operations, with a view to determining whether the present equipment is paying its way or should be replaced. Frequently analysis will show that the machine in use is not the best type for the particular operation, and an entirely new method may be suggested. In these analyses, labor costs per piece, set-up costs, idle time, floor space, first cost and other factors are given consideration, and no change is made unless the contemplated investment is justified by the indicated results to be obtained. It is our aim to have all new equipment pay for itself within two or three years through actual labor saving. Some instances of changes that have been made as a result of such investigations are shown by the examples which follow. In considering these examples it should be borne in mind that our quantities are in general limited, and the methods described might in many instances be bettered immeasurably by someone manufacturing the parts shown in very much larger quantities.

The first illustration shows a type of work formerly cut out by hand tools and filed, but now cut out by a nibbling machine from a template and filed. The part is known as a sheet straightener, and is made of $\frac{1}{16}$-in. cold-rolled sheet steel. The nibbling time is 5.70 minutes, and the filing time 7.85 minutes. Work of this nature took from ten to twenty times as long by hand before the use of the nibbler. This is ideal blanking work for a punch press, but unfortunately our quantities are too small to justify the die cost and the set-up time.



1 Sheet Straightener. $\frac{1}{16}$-in. sheet steel. Nibble all edges and then file. Total time 13.55 min. Before the nibbling machine was installed 10 to 20 times as long was required

The former method of cutting the keyway in the gear shown in Fig. 2 was on a keyseater, using a single-tooth cutting tool. The time required was 1.82 minutes per piece as against 0.47 minutes on a hydraulic broaching machine. Since the set-up time in both cases is almost the same, a saving results in doing even one-piece lots on the broaching machine. The first cost discouraged us from using the broaching method until an analysis showed that the savings obtainable would justify the expenditure.



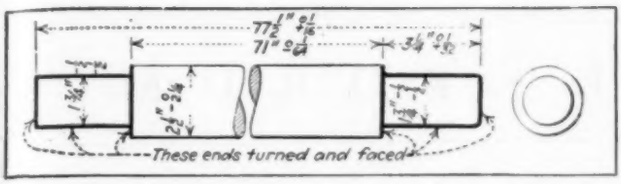
2 Feed-Roller Gear. Cast iron. Cut keyway in hub. Machining time on new equipment 0.47 min.; on old equipment 1.82 min. Increase in production, 287 per cent

3 Spur Gear. 30- to 40-pt. carbon steel. Cut teeth. Old time, 8.60 min.; time on modern machine, 4.60 min. Gain in production, 87 per cent

4 Main-Drive Bracket. Cast iron. Grind surfaces marked G. Total time on grinder, 2.10 min.; on old equipment 5.58 min.; an increase in production of 166 per cent

5 Bevel Gear Blank. 30- to 40-pt. Carbon steel. Machine from bar. Production time by old method, 23.47; by new method, on new equipment, 13.50 min. The increase in production is 74 per cent

6 Spur Gear Blank. Cast iron. Machine from rough casting. Old time, 17.30 min.; new time, 8.22 min.; increase in production, 110 per cent



7 Leg. Cold-rolled steel. Time on old equipment, 75 min.; on new equipment, 40 min.; increase in production 87½ per cent

A high-speed gear shaper replaced the old type of gear shaper to cut the teeth of the gear shown in Fig. 3. Two pieces are cut at a time and two cuts are made. The total time with the old machine was 8.60 minutes as against 4.60 for the new, an increase in production of 87 per cent. This is a true example of the increased efficiency of the modern machine tool over the old, but as an operator can run more than one machine of this type, the apparent saving is not a true saving, unless circumstances prevent the operator's time being used elsewhere during the cut.

On work that is suitable for grinding, substantial savings have been made over milling. Grinding replaced milling as the method of finishing the surfaces marked *G* in Fig. 4, which illustrates a cast-iron drive bracket. The total time for set-up and machining for the grinding operation is 2.10 minutes against 5.58 minutes for milling the same operation. We have found that there is very little saving to be made on our work by attempting to grind parts that are not readily adaptable to the circular magnetic table of the grinder; the greatest savings are possible where large numbers of comparatively flat self-supporting pieces can be put on the circular table at once, and held in place by magnetism alone.

Formerly engine lathes were used to turn steel bevel and spur-gear blanks. The blanks were cut from the bar with a cold saw, bored, and then turned on an arbor. The time for completely machining the piece illustrated by Fig. 5 in this manner, not including sawing off, was 23.47 minutes. The next step was to produce the blanks from the bar on a turret lathe; the time was 13.50 minutes including cut-off, or an increase in production of over 75 per cent. These same pieces are now being machined complete on a single-spindle automatic screw machine in 7.90 minutes, with one man operating four machines; this is an increased production of 280 per cent over the turret lathe. It has been our experience that the tooling cost is about the same for the screw machine and the turret lathe, and the set-up time on the automatic screw machine only slightly longer than that of a hand screw machine, so that on this type of work we are able to run lots of fifty pieces or more economically on the automatic.

A similar job, so far as equipment goes, is the cast-iron spur-gear blank, Fig. 6. On the engine lathe the time was 17.30 minutes. On the turret lathe the time is 8.22 minutes, or an increase in production of 110 per cent. We believe that our quantities will allow us to change from the turret lathe to automatic chucking machines on this work and that we will thereby effect a still further substantial saving; this change is under investigation at the present time.

In the operation of turning and facing the ends of the cold-rolled steel leg, Fig. 7, an increase of 87½ per cent was obtained. The equipment change was the substitution of a modern lathe made especially for turning shafting in place of a general lathe of an earlier type. The production time, including set-up and machining, is 40 minutes on the new equipment as against 75 minutes on the old.

There are other outstanding examples of improvement in our shop which do not, however, permit of a comparison of specific figures. For example, drilling and boring of holes in jigs and fixtures is now being done on a jig-boring machine in from one-fifth to one-tenth the time formerly required by the buttoning method. A pneumatic riveter does three times the work that it is possible to do by hand. An endless belt sander is used to finish surfaces formerly draw-filed and then finished with abrasive cloth, resulting in great saving in time. Savings have been made by using gas welding in the manufacture of certain parts, and investigation indicates further great savings possible by the use of butt welding. A cold saw with a multiple-cutting arrangement, permitting easy handling and gaging, with an overhead tram rail to feed stock to the cut-off saw has resulted in a 350 per cent increase in production.

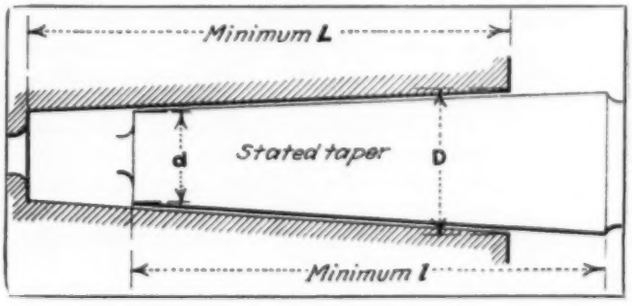
In general we feel that the manufacturer must overlook no opportunity to acquaint himself with more productive equipment; self-satisfaction is dangerous. The equipment builder is constantly improving the machinery at his disposal, and to maintain his position against competition the manufacturer must adopt these improvements as fast as the savings justify the capital expenditure required.

The Standard Taper Problem

Discussion

By F. Trevor Daniel
G.I.M.E. Sydney, Australia

I WOULD like to offer a suggestion regarding tapers, as mentioned in an article on page 769, Vol. 68, of the *American Machinist*. In studying tapers I have many times been struck by the absurd methods of dimensioning. Makers, for example, will give both diameters (large and small) of a socket, also the lengths, and



Invariable basic features of tapers

the taper. Giving a workman such a drawing is, in general, confusing. He is never sure which is the basic dimension for diameter and if sometimes a special extension or overlength taper is required, he does not know which diameter is to remain constant.

The sketch shows my idea of what should be denoted as basic features and in valuations marked as "invariables." They are the only sizes necessary to insure fitting without interference.

The two minimum lengths *l* and *L* would be fixed by considerations of the taper, *d* and *D*, and by the necessary end clearance and wear allowances.

When the Rush Comes

KNOWING how to handle even a little more than normal business isn't always an easy problem. The sales manager and the production man were in the manager's office. "Bill" Holland was there by invitation.

"Here's the situation, Mr. Holland," said the G. M. "We've just drawn a nice fat contract, and Jackson tells me he can't possibly get it out on time. Wants Bricker to stall them off for part of the delivery."

"Don't see how I can," said Bricker. "Here I've sold them on the basis of our having a crack-a-jack plant that can do anything—and then Jackson wants to throw me down."

"Not *wants* to, Bricker. *Has* to. If you'd consulted me before you tooted our horn quite so loud, I could have shown you that it can't be done with our present plant."

"We can get more men and more machines," spoke up the G. M. "We can hire extra space or perhaps farm out some of the work. Isn't there some way that we can speed up a bit?"

"Of course we can boost our normal production appreciably in a pinch, Mr. Manager, for a reasonable period. But Bricker here has promised deliveries that would take a shop half again as large as ours. We've got a good crew of men, and I can get them to speed up ten or even twenty per cent for a time. But not indefinitely. And there ought to be a bonus if they do."

"Why a bonus, Jackson, if they are really loyal to the firm?" asked the G. M.

"Because they are human like the rest of us. If we work extra hard we like to get paid for it. And they know it would cost you more money to get it done outside—if you could."

"But that won't help us much—we've got to complete the contract in four months—twenty per cent won't do it. If Jackson can't do it or can't get it done, we're sunk," wailed Bricker.

"If I were as good a salesman as Bricker is," said Jackson, "I could sell them on the idea that in order to give them the very best machines, that will suit them and us, we've got to build them in our own shop and build them very carefully. We could farm out a lot of parts, but there would be more grief than you've ever had. I'd like to hear what Mr. Holland's experience has been in such cases."

"Doubling the output of such a plant as yours is a real problem, Jackson. I've seen a lot of cases, both during the war and since, and it usually takes more time to get the increased force into working shape than anyone thought it would."

"Can't we put on more men, Holland—and work two shifts?" asked the G. M.

"You can, but I'm afraid the main difference you'll notice will be in a bigger payroll. If you built a rough machine I'd say you could double up men without much trouble. But on your class of machine it requires good men, and they are scarce. Even if you could get them it would take time to get them accustomed to just what sort of fits you had to have on different parts. It's mighty easy to lose a lot of time when you are breaking in new men on any job."

"Then you agree with Jackson, I take it," said the G. M. "How about his bonus?"

"Well, I knew two cases during the war that were very much like this. One shop tried to double its output by hiring a lot of new men—the other worked in all the extra men it could without upsetting the men who did the job. Incidentally, they gave a bonus based on the increased production.

"The shop that tried to double the output fell below the other. The new men spoiled a lot of work and the total production was no more than in the other shop—and the cost was a lot higher."

"Then you don't think we can increase our production, Mr. Holland?" asked Bricker, a bit sarcastically.

"Of course you can. But it may not pay you to do it. When you do increase, you'll find it a lot better to do it gradually than to try to double it within a few weeks."

EXECUTIVE FORUM

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

Profits for Builder and User

A machine manufacturer does not tack excessive prices on his machinery so as to become rich overnight. Anyone who thinks so has the wrong thought, for there is entirely too much competition in the machinery selling field to allow practices of this sort.

It is the policy of the company with which I am connected, to purchase machinery in accordance with the savings that may be derived from the installation of same. The method through which these purchases are made is most systematic. For instance, we had a case where three standard milling machines were employed on a special keyway-cutting job, which necessitated the use of three skilled operators. One of our engineers decided that a new machine with a continuous milling fixture and special attachment could handle the entire job in less hours, and eliminate the three standard milling machines for other work, and two of the operators. He immediately wrote up what is known as a cost reduction case, explaining the advantages of the new machine, the ultimate cost involved, the savings over a period of one year, and other data required for such a case. The recommendation was approved and the machine was purchased.

The purpose of our company, when purchasing machinery, is not to determine how low a price we can realize, but how much we can increase our profits by the use of a higher grade of machinery. —Fred Aug. Schmidt.

The buyer will strain his ingenuity to the utmost in devising ways to get along without something for which he considers that he is being overcharged. In the case of the special machine tool, the user may sacrifice profits for the sake of his pride, by rebuilding some standard machine to do the special job, or even by designing his own machine, or he may simply wait until he can find some builder with more modest profit ideals. Even though he should buy the machine, he won't want to buy another from the man whom he thinks took advantage of him.

It is the seller's business to show the purchaser that the price asked includes only a reasonable share of the cost of development and experimental work, and of the tools and fixtures required. As everybody knows, these cost plenty of money in the case of special machines. Let the user get the idea that, in buying one or two machines, he is paying for the last five years' losses of the other man's business, or for the total tool cost, and the sale is spoiled.

A "padded" price cannot be justified by the fact that the purchaser will make money, even at the high price charged, because the buyer takes all the risk, and calculated profits do not always materialize. For similar reasons, rental agreements based on earned profits may easily become sources of controversy and litigation.

—Charles Sprague Hazard.

The Price per Pound

When it comes to machine tools, the price per pound does not seem reasonable, for weight bears no real relationship to capacity and workmanship, which are what is being sold. Once it becomes known that price is being based on weight, the engineer responsible for estimating weights will tend unconsciously to keep his estimate high to cover contingencies when the design is actually made.

If detail design shows that costs are going to run a little high, it is very easy for the designer to "beef up" the design to the maximum estimated weight figure so that it looks as though everybody guessed right when the final returns are in. Whenever you base data on inconsistent factors, you tempt employees to make it come out right and save trouble. This tends to prove your theory, but distorts your facts.

—John W. Campbell.

Beware of Stratification

John Lockwood will be sure to find the right man in his own organization if he will just get off far enough for a bird's-eye view. When he considers a man from the outside for such a position, he looks at the big things needed for the job. That is proper, but how about the candidate from his own organization? Does he not think of this man solely in terms of the everyday details and routine of his present job? If he could forget all this, and size his own man up for essential general qualities, would he not look at him with greater favor? Of course, his particular job may suffer temporarily because of his promotion, since no provision for understudying jobs seems to exist. However, if we promote all along the line we may only have to worry about hiring a new helper instead of a new executive.

A personal interview with this man is necessary, and may bring to light some startling facts. Some men are aggressive and visibly ambitious, others tend to keep quietly concealed. Men who, by their very reticence, may never have been noticed, may on invitation, exhibit remarkable qualities. To find these men is John Lockwood's job. —Joseph J. Purdy.

Inspection Methods *and Their Application*

By Fred H. Colvin
Editor, American Machinist

Inspecting and testing valve springs, oil pumps, brake and clutch pedals, starting motors, piston pins, wheel hubs and miscellaneous parts

EVERY valve spring that goes into a Franklin engine is tested by the apparatus shown in Fig. 175. At the left is an arbor press rigged up to be operated by the foot, and on which the spring is "set" by being compressed several times into a closed position before its pressure is taken. The spring-testing device, shown at the right, was built in the Franklin shop. It consists of a crosshead, *A*, carrying the hand-operated plunger *B*, which compresses the spring under test. The spring is carried on the platform *C*, which is supported by the spring-balance at the top. When the spring has been compressed the proper amount, an electric contact is made and the lamp, *D*, lights. The inspector then reads the dial of the scale, and unless it shows the predetermined figure, the spring is rejected. The use of the electric light is considered more rapid and satisfactory than index or pointer marks with which to note the amount the spring has been compressed. The flash of the lamp is instantly visible to the inspector and enables him to keep his eyes on the scale of the spring balance.

One of the features of the Franklin engine is an oil pump that carries independent oil leads to eight different points in the engine. In order to thoroughly test each pump before it goes to assembly, a special testing device, Fig. 176, has been built. The driving head *A* is actuated by the small motor *B*, and drives the pump shaft by its slotted end, as in the assembled motor. The pump is supported by its upper flange by means of the hook bolts at *C* and in this position the pumping unit is completely submerged in the oil in tank *D*. With the pump in operation, oil is forced through every lead, and the pressure at each point can be easily checked by means of the small pressure gages shown. It insures that the pump will deliver oil to each point, before it goes to be assembled into the engine.

In order to be sure that the clutch pedals come in exactly the right position and swing on the proper arc through the floor board, it is necessary for the clutch and brake levers to be of the correct shape and to have their holes for connection in the proper position. The plate shown in Fig. 177 indicates the way in which these levers are tested in the Franklin plant. With a lever mounted on the stud, *A*, it is an easy matter to test the position of the hole *B* by means of a plug gage. At the same time a test bar *C* is fastened in the lower end of the lever, to represent the stem of the clutch pedal.

In order to secure the desired operation of the levers and pedals, it is necessary for the hole in the end of the lever to be parallel with the test bar *C* when the lever and the test bar are in the position shown. This inspection requires little time and insures correct assembly.

The compactness of design of the modern automobile necessitates fairly close clearances even in the mounting of the engine in the frame. An example of this is shown in the engine rail or support used in the Franklin car. In Fig. 178 the inspection fixture is shown.

The large holes in the center fit over the pins in the block *A* when the vertical side of the rail is against the surface *B*. This brings the left end of the rail against the templet *C* and the right-hand end against *D*. This fixture makes it easy to check the relative location of all the holes and avoid interference when the rail goes to assembly. The Pierce-Arrow valve springs are tested on the scale shown in Fig. 179. A special fixture has been built over the platform of the scale, and is so arranged that the inspector can apply the desired pressure through the pedal at the right. Pressure on the pedal forces a rod hung on the arm *A* down on the spring and the pressure is read on the dial. The compression of the spring is also noted. The beam over the spring is returned by counterweights. Starting motors, generators and ignition apparatus are tested in the Pierce-Arrow plant on the bench shown in Fig. 180. A flexible-

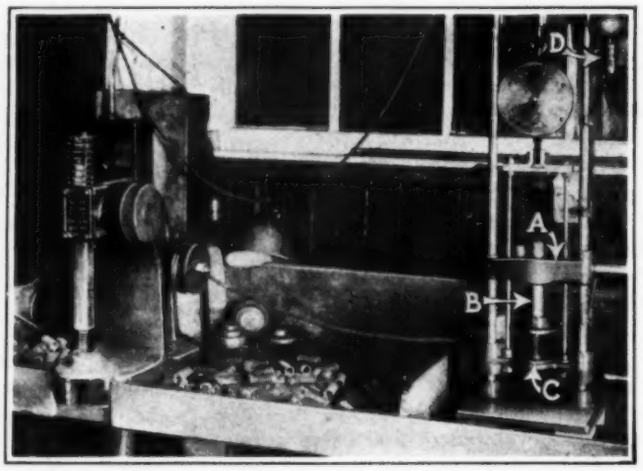


Fig. 175—Valve spring testing at the Franklin plant. Springs are "set" in the machine at the left. They are then put in the device at the right and pressure required to close them to the proper length is applied. The light flashes when the spring is at the proper length and the scale reading then is taken

Conclusion of the eleventh article. The twelfth will appear in an early issue.

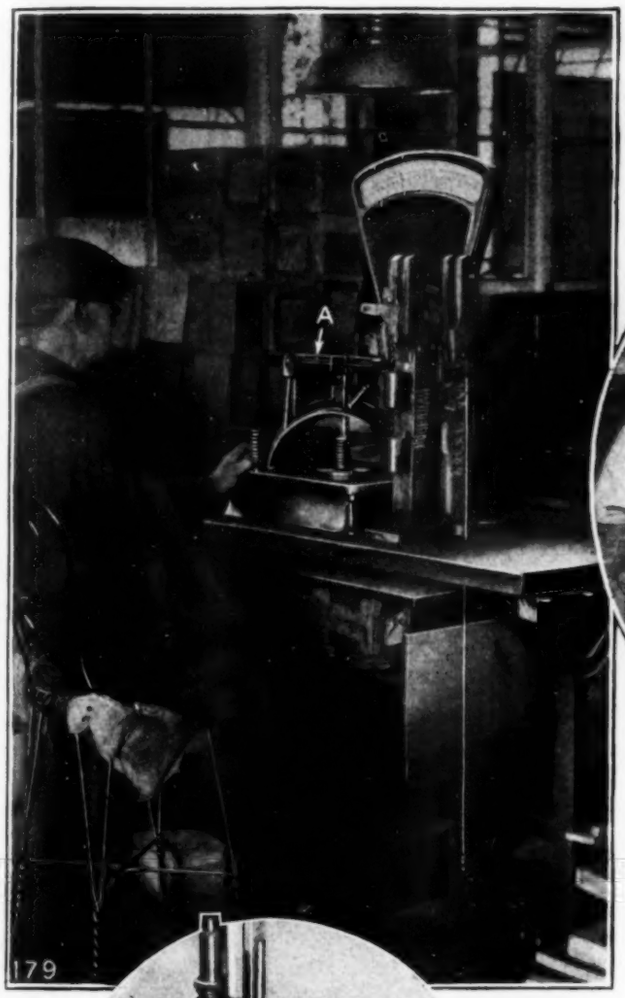


Fig. 179 — Pierce-Arrow method of testing springs. The testing device spans the platform of a standard scale and carries the overarm A. The compression of the spring is also noted

Fig. 180—Starting motors, generators and ignition apparatus are tested on this bench. As shown, the driving motor is running a generator for the car. The starting motor is shown at the right. All necessary instruments are on the panel in front of the tester

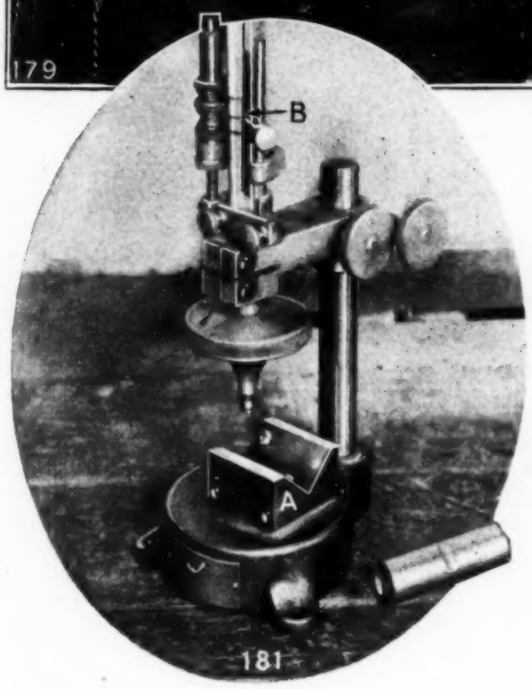


Fig. 181—Prestwich gage fitted with special diamond points for checking size and roundness of piston pins. There are four diamond points mounted in suitable holders, two being plainly shown. Revolving the piston pin on these diamond points checks the accuracy very closely, the liquid showing between the tolerance marks

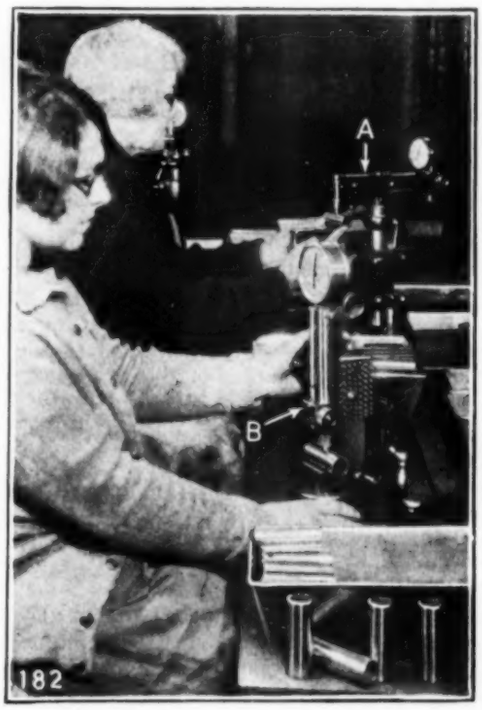
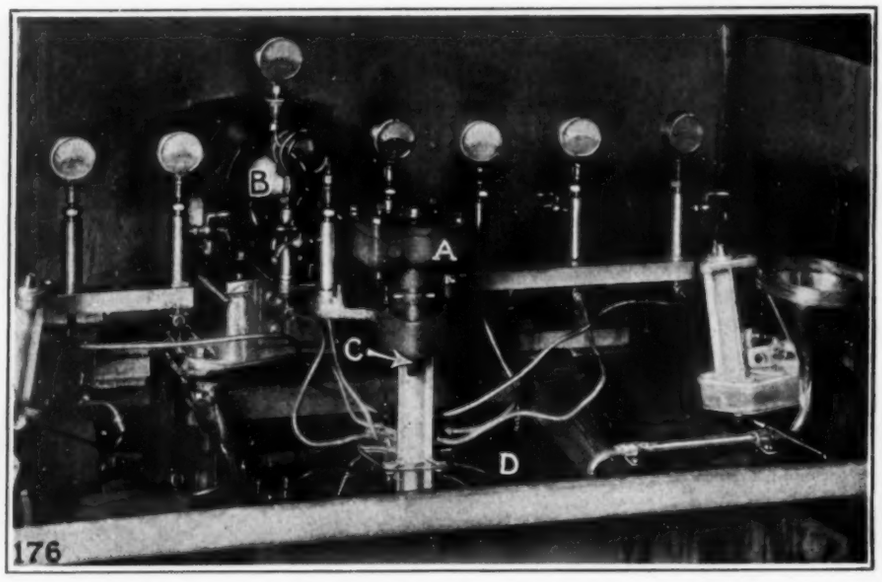


Fig. 182—Two tests on piston pins are shown here, one the checking of diameter, roundness and taper on the multiplying gage in the background. The hardness is also being tested by the scleroscope in front



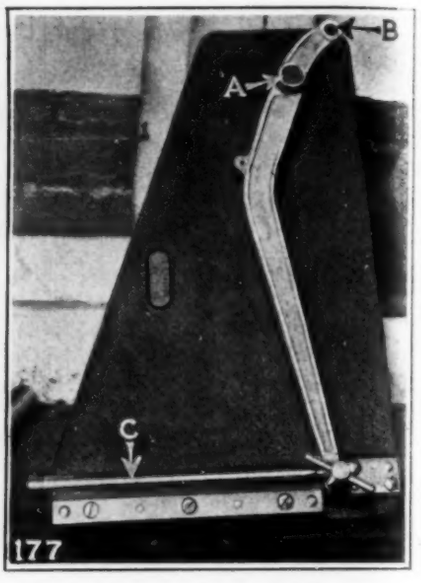


Fig. 176—Testing the oil pump that supplies lubricant to each of the seven bearings of the crankshaft. The pump is clamped in place by hook bolts and the pressure at the end of each pipe line is noted. Fig. 177—Checking the location of the bearing holes and the angle of the clutch-pedal hole. The two end holes are located by a plug using the fixed stud as a base. The straight-edge at the lower end shows whether or not the angle is correct

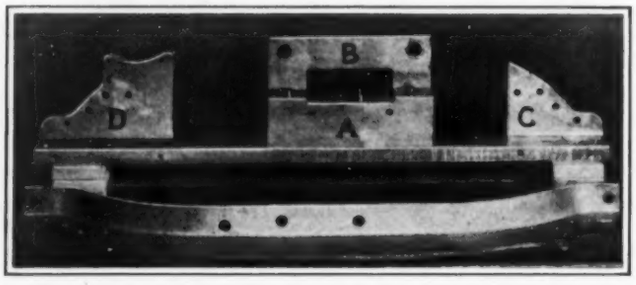


Fig. 178—Proper location of the holes in the engine cross-rails, or bearers, is important in assembling. A rail is shown in front of the fixture and in a reversed position. When laid in position on the fixture the three studs locate the rail by the holes in the center, and the shape of the ends as well as the hole-layout can be easily checked

coupling drive is provided, and the instrument board in front of the inspector shows exactly what is being done by each piece of apparatus. The illustration shows a generator on the test stand with a starting motor on the bench at the right.

In the inspection department of the Franklin plant, a Prestwich gage is used for measuring the diameter of piston pins at each end, to check both the roundness and the amount of taper. For this purpose a special V-block is provided, at *A*, Fig. 181, this block being equipped with four contact points, on each of which is mounted a diamond to take the wear.

The sensitiveness of this gage is indicated by the wide space between the pointers at *B*, it being only necessary to see that the liquid in the gage stays within the limits occupied by the pointers.

In Fig. 182 piston pins are being tested at the Oakland plant, for diameter, roundness, taper and hardness. The dimensions are checked by the multiplying gage at *A*, while the scleroscope at *B* tests the hardness at different points. It will be noted that the anvil, or table of the gage *A*, is narrower than the length of the pin. This narrowness enables the inspector to roll the pin under the indicating point with the forefinger of each hand, aiding greatly in rapid inspection.

The method used in the Pierce-Arrow plant for checking the accuracy of the wheel hubs is shown in Fig. 183.

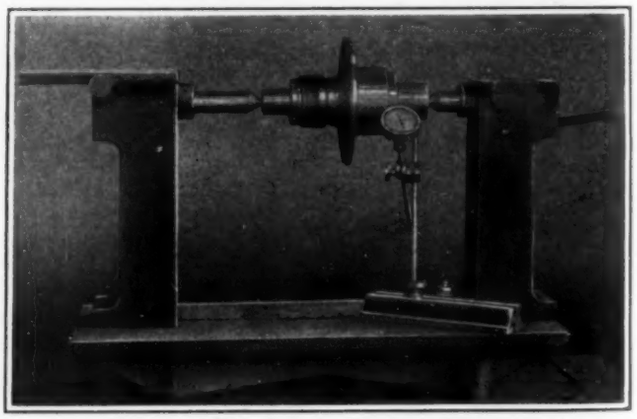


Fig. 183—Checking concentricity and wabble of a wheel hub at the Pierce-Arrow plant. Each hub is mounted on a mandrel and tested between centers, using a dial indicator on the various surfaces

A hub is mounted on a testing mandrel having a stationary cone at the right and an adjustable, knurled cone at the left. Mounted in this way it is easily revolved and the indicator shown can check the concentricity and accuracy of any of its surfaces.

This operation, perhaps, shows as well as possible, the refinement that has taken place in automobile construction. Where malleable iron hubs were formerly used, we now have steel forgings and we are not satisfied until the flange is almost as true as though it were a part of the engine itself.

The new Parliament Buildings in Tokyo

Engineering and Industrial Development in Japan

Outstanding facts that show how Japan is developing along various lines—Increasing use of electric motors indicates a movement toward higher productivity

IN VIEW of the World Engineering Congress that is to be held in Tokyo from October 30 to November 30, 1929, it is well to have an appreciation of the engineering development of Japan. As can be seen from the data and statistics that follow, Japan has developed and is developing many industries that will be well worth seeing and studying. Engineers, and those engaged in manufacturing industries, will do well to embrace the opportunity of seeing what has been done, often under adverse circumstances, to inaugurate industries in Japan and to develop them to their present state.

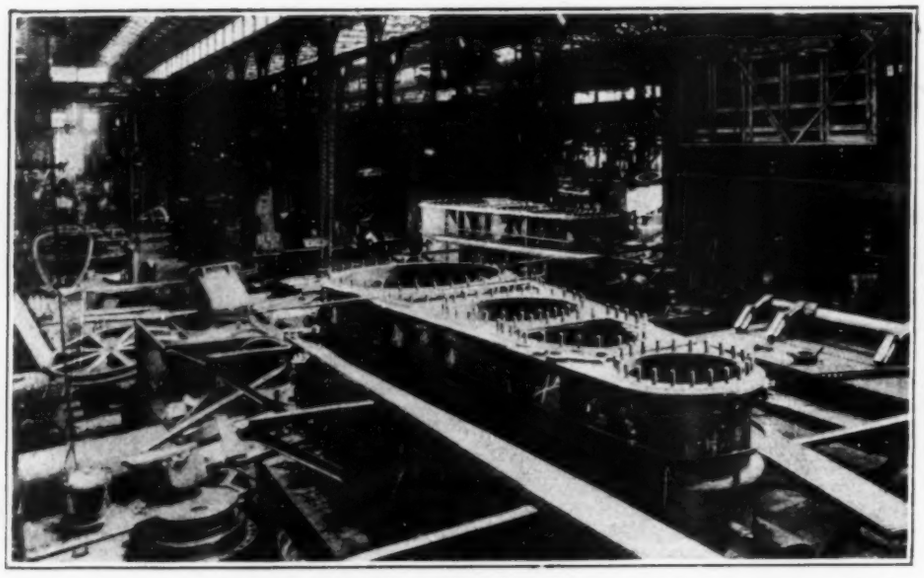
Japan is somewhat handicapped in the matter of raw materials, although gold, silver, copper, iron, manganese and other metals, as well as coal, are found. Of these perhaps copper and coal are of greatest importance. Iron is not found in large quantities and is largely imported from China, the Strait Settlements and elsewhere. Manganese and zinc come from Russia and China. Pig iron comes largely from British India, South Manchuria, China, Great Britain, Sweden, and Germany, this item amounting to 16.6 million yen—approximately $8,000,000, in 1925. Lead, of about the same value, was also imported from Canada, India, and Australia, with a little from the U.S.A., Dutch India, England, and Siam.

Summed up, the imports of a few metals and of steel bars, calling a yen 50 cents for easy figuring, although this is a little high, were as follows:

COMMODITY	VALUE
Pig iron	$ 8,300,000
Lead	8,300,000
Zinc	6,000,000
Tin	4,500,000
Aluminum	2,900,000
Copper	1,450,000
Steel bars, pipe, etc	45,500,000
Steel rails	2,500,000
Steel screws	500,000

Japan imports many kinds of machine equipment, although these imports are being reduced by the growth of its own manufacturing industries. Some of these imports for 1925 were as follows:

COMMODITY	VALUE
Wattmetrs from England, Germany and U. S. A.	$1,100,000
Other meters, dynamometers, etc., from same sources	1,300,000
Water tube boilers and accessories from England, France, Germany, Switzerland and U. S. A.	2,900,000
Steam turbines from same sources, except France	700,000
Gas and oil engines (except Diesel), from England, Germany, Switzerland and U. S. A.	2,850,000
Diesel engines from same sources and from Sweden	2,850,000
Electrical machinery from England, Germany, Switzerland and U. S. A.	5,950,000



The erecting shop of the Sakurajima works, with a triple expansion steam engine in the foreground. A second set of cylinders can be seen over the first

Air compressors and pumps from England, Germany, Switzerland and U. S. A.	1,600,000
Metal and woodworking machinery from England, France, Germany, Switzerland and U. S. A.	2,850,000
Textile machinery from the same sources as above	3,850,000
Printing machinery from England, Germany, Holland and U. S. A.	1,300,000
Total	$27,250,000

But, lest we stress imports too highly, it is well to examine the figures showing manufacture in the leading industries, the figures available being those for 1925. In most instances they show a healthy increase over previous years. There are, of course, a few exceptions, such as shipbuilding, where the production has decreased. The total value of the production is somewhat startling:

Textiles (spinning, weaving, etc.)	$1,059,000,000
Metal industries	181,250,000
Ceramics, rubber, fertilizer, etc	334,400,000
Miscellaneous	19,900,000
Total	$1,594,550,000

Taking a few items from the metal industries we find other interesting figures, such as:

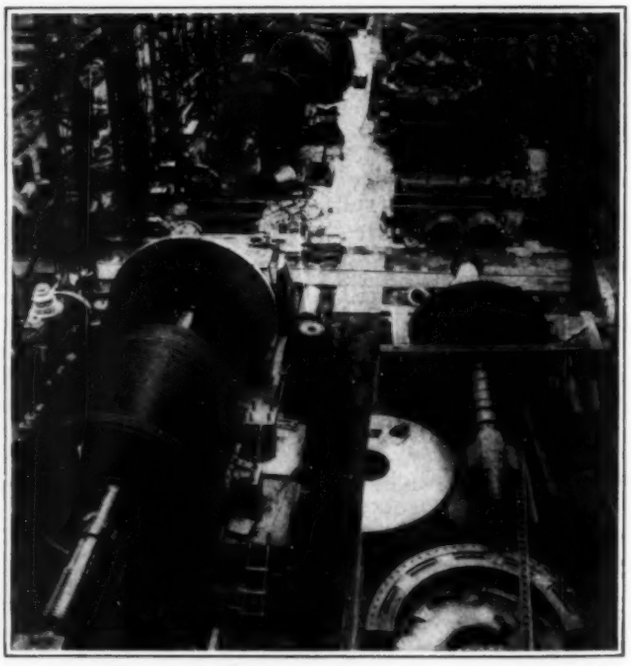
Electrical machinery	$ 60,050,000
Machine tools for metal	3,150,000
Machine tools for wood	1,300,000
Railway trolleys, etc.	21,350,000
Prime movers	9,400,000
Bicycles	11,800,000
Measuring machines	4,900,000
Textile machinery	2,200,000
Total	$114,150,000

Not only did Japan build this rather astonishing total of machinery, but she exported the goodly total of $4,842,500. This total includes $1,726,500 for textile machinery, over 80 per cent of the total manufactured, which indicates the rather unusual condition of importing $3,850,000 of textile machinery while retaining only $473,500 of that manufactured. Exports of metal and woodworking machinery are given as $138,500, a very small amount as compared with the imports.

These exports go to China, Manchuria, Hong Kong, British and Dutch India, Asiatic Russia and Australia. China takes nearly half the total, with Manchuria a close second, British India third and Hong Kong fourth. It seems a bit odd to separate China, Manchuria and Hong Kong, but they are the official divisions at present. Exports to the above named countries seem to be growing, while exports to British and Dutch India, Asiatic Russia and Australia are decreasing.

Invested capital is a good index of the industries of a nation, showing the faith of investors in the future of the country's business. The data of Table I are of interest as showing the capitalization and actual paid in capital in industries of more than $25,000 nominal capital. The number of plants related to the metal industries is given as over 1,300 in 1925, not including mines, smelting, government railroads, or other government works. Bonded debt is not included in the table.

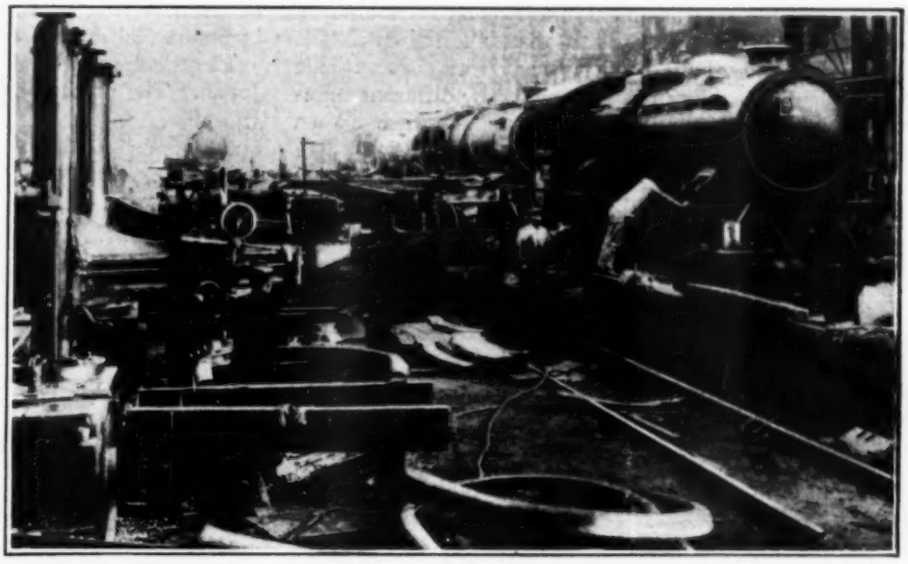
Statistics of employment are quite up-to-date and are the more interesting on that account. The figures given are for April, 1928. The decrease in the shipbuilding employees is more offset by the increase in other lines. The total number in industry is given as 927,859 for April, 1928. Of these 55 per cent are women, mostly in textile industries. The table follows:



The steam turbine shop in the machine works of the Kawasaki Dockyards, where several large turbines are being erected

	No. of plants	No. of persons
Shipbuilding	52	42,531
Vehicles	54	13,648
Metal works	253	42,784
Tools and instruments	139	19,639
General machinery electric machinery, motive machinery and others	183	47,641
Total	681	166,243

Osaka is known as the Manchester of Japan, having 206 plants with more than 100 employees. Municipal statistics for October, 1927, give the number of employees as 88,884 at that date. Of these, 44,573 were in 53 textile plants, 23,471 in 57 metal working plants.



The locomotive department of the Kawasaki Dockyards where locomotives are being assembled. Two large radial drilling machines are shown at the left

The wing shop of the airplane factory in the same Kawasaki Dockyards. These views show the great variety of work carried on in a single plant

Table I—Analysis of Invested Capital in Plants

	No. of Plants	Nominal Capital	Paid Up Capital
General machinery	293	$64,500,000	$35,950,000
Electric machinery	218	114,050,000	70,450,000
Motive machinery	51	12,250,000	7,750,000
Shipbuilding	71	133,100,000	80,400,000
Vehicles	81	27,900,000	14,350,000
Metal works	366	90,550,000	59,600,000
Tools and instruments	179	34,600,000	21,650,000
Others	54	11,050,000	8,500,000
Total	1,313	$488,000,000	$298,650,000

Electric current generation and railways are large industries in Japan, over 9 billion kilowatt hours being generated in 1926 and being greatly increased since that date. Of this, 89 per cent is by water power, nearly all the rest by steam, with one-tenth of one per cent by gas power. Steam plants used over 2½ billion pounds of coal at a cost of over 6½ million dollars, or 2.66 lb. of coal per kilowatt hour. Coal, on this basis shows an average cost of $5.20 per ton.

Electric railways and current generation employed 132,438 persons and had an invested capital of over a billion and a half dollars. The use of electricity is growing rapidly, even in the face of cheap labor. It increased over five fold between 1913 and 1925 and is still going up. Figures show nearly 300,000 motors in use, developing over 2¼ million horse power, this being an increase of more than 200,000 hp. over the preceding year. Electro-chemical industries used over $50,000,000 of current during the year, of which over $22,000,0000 was for electro-deposition and over 1½ million for the production of iron and alloy steel.

Railway growth in Japan is indicative of the way in which the country has advanced industrially in the last 50 years. The first railway line, 18 miles long, between Shimbashi (Tokyo) and Yokohama, was opened in 1872. In February, 1928, the mileage had increased to 11,615, of which 8,285 miles are owned and operated by the government. The government railway has nearly 4,000 steam locomotives, including 1,087 tank engines, 2,067 with tenders, and 89 electric locomotives, beside others for suburban service near Tokyo. The locomotives burn over 2½ million tons of coal per year and over 200,000 persons were employed in 1926. The fast trains between Tokyo and Shimonoseki, about 700 miles, average 34 m.p.h. with a maximum of 59 m.p.h., and this on a gage of 3 ft. 6 in., which is standard all over the country. The railways cost about 1¼ billion dollars, all but $200,000,000

of this being for government lines. The total amount spent on railways is nearly half that invested in all the industrial works of the country by private corporations. A comparison of the railways provided by different countries per 100 sq.mi. and per 10,000 population is shown in Table II.

Table II—Comparison of Railroads of Various Countries

	Mileage of Railway	Area, Sq.Mi.	Population	Mileage per 100 Sq.Mi.	Mileage per 10,000 Persons
British Isles...	24,398	121,633	47,301,601	20.1	5.2
U. S. A.....	251,437	3,026,789	101,710,620	8.3	23.7
Germany.....	35,823	185,889	59,838,284	19.3	6.0
France.....	33,281	212,659	39,402,800	15.6	8.5
Italy.....	12,501	117,982	38,635,184	10.7	3.2
Japan.....	11,615	148,822	55,963,053	7.8	2.0

The percentage of seats actually occupied at all times compares very favorably with other countries, and seems to be steadily rising, indicating that people are traveling more than formerly. Rails began at 50 lb. to the yard, and have been increased until the 100 lb. rail is now standard, lighter rails being replaced as fast as possible. Locomotives started at about 40 tons in weight and now run up to 120 tons.

At least four plants in Japan build locomotives and cars, the number of locomotives built in one year being given as 304. There are, however, nearly 300 shops where railway work is done, this including both government and private railway shops and others. Seven of these shops employ over 1,000 people. The shops included in this industry consumed over 30 million kilowatt hours of electric current per year. The Imperial Government Railway has 21 plants in which 15,895 people are employed. This number includes 12,355 workers, 790 foremen, and the balance being executives and office men. The production is given at over 20 million dollars. Three of the large private builders of railway equipment employ over 2,000 each.

Shipbuilding is an important industry in Japan, employing well over 100,000 men and drawing between 1½ and 2 million invested capital. None of these figures include naval dockyards or government work.

Electrical machinery is another growing industry in Japan. The production in 1926 was:

Electric machinery and parts	$ 52,601,033
Electric light globes	8,053,014
Wire and cable	56,775,529
Total	$117,429,576

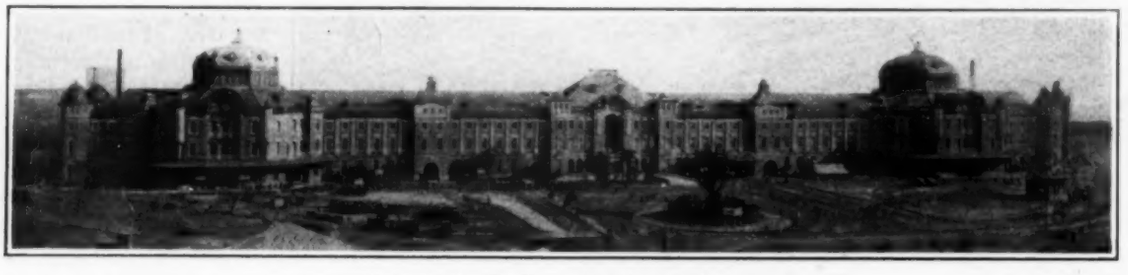
These were the products of 218 companies.

Machine tools form but a small part of the industries of Japan as compared with those mentioned. It reached fairly large proportions during and immediately after the World War period, but has since decreased, although it amounted to over 2½ million dollars in 1926. The highest figure given is nearly 5 million dollars, in 1921. The exports are small, being slightly over $138,000 in 1926.

Imports of both metal and woodworking machines are fairly heavy, and largely from the U. S. A. The total average value of such imports in 1924-25 was over $3,000,000, of which over $2,000,000 was from the U. S. A., with Germany, Great Britain, Switzerland and France following in the order named.

Inquiry as to machine practice indicates that the Japanese follow about the lines that might be expected in a country where mass production, as we know it, has not yet become possible. Taking grinding as an example, we find that while it is used largely as a method of finishing parts requiring precision, it is not yet being used in roughing operations in many cases.

Material handling is receiving considerable attention in the larger plants, power houses, steel works, railway stations and mines. The introduction of conveyors is being considered in plants where the output warrants and conveyors of different kinds are likely to find their way into the shops in the near future. Heat-treating equipment is in a similar state. Some form of heat-treating apparatus is to be found in shops where annealing or hardening of any kind is necessary. Some plants have apparatus of advanced types, and these modern installations are sure to grow as the shops develop.



The Union Railway Station in Tokyo

Jig and Fixture Design on an Organized Basis

Jigs and fixtures are of paramount importance in any metal-working plant—that goes almost without saying. But up to now there has been little attempt made to gather together the vast store of design information on these tools that has been worked out over a period of years. Next week, however, the *American Machinist* will begin to present in full Professor Roe's paper on Jig and Fixture Design, which he will present at the annual meeting of the A.S.M.E. It is an admirable compilation of essential jig and fixture data and rules for economic tool planning, and will undoubtedly be the forerunner of a complete organization of tool design knowledge which, without question, is of vital importance.

With the Automotive Engineers at Detroit

Abstracts of some of the papers presented at the production meeting of the Society of Automotive Engineers, November 22 to 23, at Detroit

Progress in Honing-Machines and the Honing Process

By C. G. Williams
Designer, Barnes Drill Company

HONING did not begin to be regarded as a real manufacturing possibility and adapted to production methods until late in 1925, or early in 1926. Up to that time, hone-heads generally had been made up only as attachments to be used with electric or air-operated drills, or possibly to be rigged up by the purchaser in an old drillpress.

Honing may properly be called a phase of grinding with a wide wheel. However, in external grinding with a wide wheel, when the work is longer than the width of the wheel, the wheel is fed to the work in the initial position; then, when the desired depth has been reached, the wheel is withdrawn, moved to another location, and again fed to the work. In contrast with this, the hone which is of expanding construction and, in the latest types, is under a powerful feed for expansion, is reciprocated or fed rapidly along the surface of the work, and, therefore, the process takes on the nature of grinding with both a wide wheel and a narrow wheel. However, because of the length of the stones, the slight chatter-marks that are to be detected on all surfaces ground with the narrow wheel are eliminated, as is also the tendency of the wide wheel to be scored at various points by hard spots in the work.

Another objection to the use of the narrow wheel in grinding, which is avoided in honing, is that, when a cylinder-block is bored, the boring tool has a tendency to dig to a slight extent into the soft spots that are found in almost all cylinders, and leave them hollow. These hollows may or may not be entirely removed by the reamer, but the fact has been impressed upon us that reaming also leaves low spots in the cylinder-walls and may also result in a cylinder that is tapered from a fraction of a thousandth up to several thousandths of an inch in the length of the bore.

Where soft spots exist, the narrow grinding-wheel (and the cup wheel is to be classed as a narrow wheel) also digs in slightly, so that depressions appear after even very careful grinding. At first these were thought to be the effect of chattering, but it was shown that chattering exists apart from the low spots, because the chatter marks appeared in the low spots, although to a less extent than over the hard spots, thus indicating that soft spots existed and that the natural spring of the spindle allowed the wheel to enter the spots and remove metal from the surface. The long honing abrasive-sticks, however, bridge over these low spots as the hone is simultaneously rotated and reciprocated, until the hard spots are cut down to the level of the hollows, after which the whole surface is reduced at the same rate, the hard spots being cut down to the depth to which the soft spots are cut. Thus the honing process leaves the cylinder-walls round and parallel, free from taper, and smooth in proportion to the fineness of the abrasive used.

Honing will do little or nothing to correct misalignment, according to present practice, if the axis of one bore does not lie in the same plane as the axis of the other bores. Rather, the purpose of honing is to straighten inequalities of the bore and to give the smoothest finish that it is possible to produce under present production methods.

No practical conclusion regarding the best speeds can be drawn yet from the experience of users of honing-machines. With a variation in spindle speed from 124 to 315 r.p.m. and in reciprocations from 11 to 160 cycles per min., there is no uniformity of practice that can be regarded as useful in forming a standard, for personal opinion only seems to govern the use of hones at present.

Six companies are now making hone-heads, and most of them employ the same principles of construction and application. The abrasive stones have, on the whole, been slowly reduced in size until, whereas formerly the approved size was 6 in. long by $\frac{3}{4}$ in. square, today's practice is to employ stones 4 in. long, $\frac{1}{2}$ in. wide, and $\frac{5}{8}$ in. thick. This size gives better results than either longer or shorter stones, excepting on work more than 4 in. in diam. and requiring a stroke of 12 in. or more, on which longer stones are employed.

It seems probable that considerable experimenting must be done to find new bonding materials suitable for honing conditions, if success is to be assured. Stones of a grit and grade that give excellent results in a grinding-wheel cannot be used at all in honing. The honing movement seems to break them down to an extent that will not warrant their use. Again, the same grit and composition that make a free-cutting grinding-wheel will not assure a free-cutting honing-stone; it may load up with metal to such an extent that it is beyond consideration for use.

The trend at the present time points to the use of honing for removing metal on a large scale. In many instances inquiries have been made as to the feasibility of honing from the rough-reamed or the finish-bored operation, and one firm in Germany asked regarding the time required to hone in one operation a six-cylinder block that had only been bored. One firm in this country asked about the possibilities of honing the rough-cast surface. This operation is still in the experimental stage, for no stone has been found as yet that would give sufficient wearing qualities.

It was felt as late as 18 months ago that the honing of steel cylinders, and especially heat-treated or hard-

ened cylinders, could not be accomplished successfully, but the testing carried on during the last few months shows that steel in all of its degrees of hardness, from cold-rolled steel to glass-hard tool-steel, can be honed successfully as a commercial operation.

Success in grinding brass, bronze, and Monel metal has not been approached by honing to my knowledge. The few experiments conducted with these and other non-ferrous metals have shown that much experimenting and study must be done before it can be said that the problem has been solved. The present problem seems to be the determination of the proper grit and degree of hardness of the stones to use with spindle speeds that will not show a too rapid breaking down of the stone or a loading up with the metal. Grinding practice does not throw light on any of the difficulties encountered.

Some of the new developments have been the honing of Diesel-engine cylinders, large gas-engine cylinders and air compressors, and the application of honing to railroad work in the reconditioning of locomotive appliances such as air-brake cylinders, air-compressor cylinders, power-reverse cylinders, air cylinders for firedoor operating mechanism and booster-engine cylinders. As time goes on, new uses are shown for the process, such as honing the bearing surfaces of crankshafts of some of the larger gas-operated stationary engines, producing a finish that cannot be surpassed; honing needle-valve cylinders for Diesel engines, locomotive side-rods and cast-iron main-road floating bushings; and honing steel bushings 1 in. in size and larger if they are stacked in a jig. Each new use seems to necessitate further experiments to make it a success, as a hone that will give the best results in a hard close-grained cast iron will not give comparable results in a porous iron or in the so-called semi-steel. Honing the new types of cast iron, such as Gunite, needs stones of still another type and grit.

Kerosene is the coolant most in use today. Some of the users of hones employ up to 40 per cent of mineral seal-oil in the kerosene, but the majority use kerosene without admixture. Up to the present, only one user of honing-machines is using anything but an admixture or straight kerosene; in this case the report is that mineral seal-oil is used without any diluent.

It cannot be said that the most efficient use of hones has been nearly attained as yet; progress is assured for several years at least. The successful adaptation of this process depends jointly upon the makers of the honing-machines, of the stones, and of the stone-carrying heads. All who are interested must share the expense, pool their knowledge and do their share in the general experimenting that will prove the full worth of this new mechanical process.

Power-Transmission Engineering as an Economy

By W. W. NICHOLS
Vice-President and Mechanical Engineer,
D. P. Brown & Company

ECONOMICAL installation and maintenance of power-transmission equipment is not receiving the careful consideration that it should in the majority of plants.

Unless managing officials show the head of the mantenance department that they are taking an interest in this question, matters will continue to run in the same old way. They must be willing to educate their man, and advise him as to the cost of operating his department. This will lead to discarding an ancient landmark of accounting, the "maintenance account" or "power, light and heat account."

Unless costs are segregated and separate accounts are opened for such items as new installations of belting, belt maintenance and repair, lubrication, and repairs to transmission lines, how is it possible to check them when the cost sheets are made up at the end of the cost period and the maintenance items are in the past?

Another point being neglected, is the inventory value of power-transmission equipment such as belting. Rarely can an accurate cost be obtained, or even an estimate. The footage and cost of all belting should be included in an inventory of every plant, and the cost of maintenance or replacement should be shown as a percentage of this cost.

Virtually, no attention is given to the question of friction loads. In walking through a plant one will see bent shafts, weaving hangers, untrue couplings and belts that have been applied with excessive tension. All of these conditions cause loss of power by excessive friction, and all of them can be eliminated by proper maintenance. The correction measures are to realign and straighten the shafting, test the couplings for alignment and truth, and replace belts, that have required excessive tension, with heavier or wider belts, or increase their speed by the use of larger pulleys, maintaining the same ratios.

A good way to test for power is to mount a 15 or 20-hp. motor upon the platform of a high-lift truck with a portable recording wattmeter, and make records of the current required to drive the motor, first without any load, and then while driving the lineshaft with all belts to the machines thrown off. From the data on the diagrams obtained, the friction load per bearing upon the line can be determined. This information will be good for future use in checking up similar lines of shafting. By making tests such as this, instances have been found in which more than one-half of the rated power of the motor was required to drive the unloaded shafting before corrections were made, and only 12 per cent afterward.

The durability of a fabric or a rubber belt depends largely upon the size of pulley on which it is used. When a heavy-weight fabric belt is used upon a pulley of too small diameter, the outer layer of the belt has a tendency to separate from the other plies. The following are the smallest pulley-sizes on which the various thicknesses of either fabric or rubber belt can be used: Three-ply, 3 in.; four-ply, 4 in.; five-ply, 8 in.; six-ply, 12 inches.

In many cases, belts are insufficient for the load they are called upon to pull, and it is impossible to increase their width because of the construction of the machine. Such a condition can be remedied by increasing the pulley diameters, maintaining the same ratio of driving pulley to driven pulley, or by increasing the weight of the belt. Care must be taken to ascertain that the small pulley is of sufficient size for the belt determined upon.

Another method of overcoming the difficulty is by the use of a compound belt; that is, by using a second belt placed over the original belt. When this method is used, the outer belt is put on at a higher tension than the inner one, so that the latter will sag and obtain a greater arc of contact.

Lost-Time Records Should Be Kept

Rarely is an account kept of the loss of time due to troubles with belts on machines. This should be done in every plant to enable the management to determine if the size and type of belt used are correct for the work the belt has to perform. It was found in one plant that a certain machine was stopped almost every day because of belt trouble, and new belts were constantly being ordered for it. When this condition became known, after the installation of records, an investigation showed that the motor pulley was too small to give sufficient arc of contact. The belts were being burned and motor bearings were wearing out rapidly because of the excessive tension.

In many instances heavier belts are needed between lineshafts and countershafts. The practice of roping belts upon the pulleys, with the resulting high tension, causes excessive friction-loads on all of the bearings, and excessive wear to loose pulley and clutch bearings; this, in turn, results in high maintenance-costs. If a belting of heavier weight is substituted, the conditions will be rectified. In one instance in which this was done the maintenance cost of the countershaft alone was reduced 50 per cent, with increased production from the machines.

Reports should be made on the condition of pulleys and machinery, including those that are out of line, and on oily or sloppy conditions and any other factors affecting the efficiency of operation. Belts having excessive tension should be reported.

Records should be made in connection with daily inspection of test belts, including wattmeter readings under running and starting conditions. Records should also be made of the amount of metal being removed per minute by machines that are operated by test belts; also specifications of the materials, and observations as to the condition and grinding of the tools. Time and cost of maintenance should be recorded; and also any changes in belt length.

All forms used for records and reports should be standardized. Records should be kept of all belts and pulleys in service, including their speed.

Foremen should report to the maintenance department any improper conditions existing in their own departments, such as belts rubbing on guards; shifter forks set too close or badly worn by belts; belts on cone pulleys that have a tendency to climb, and all belts tending to run off the pulley; splashing of oil or cutting compounds upon belts; conditions where guards are needed to prevent injury to operators in case of belt breakage; and any condition where belts need to be run so tight that a rope is necessary to put them on the pulleys.

Interpretation of Production Records

By Paul Geyser
Vice-President Directing Taxicab Sales
General Motors Truck Company

THERE are four profitable lines of approach to this matter of records. In the first place, records furnish a basis for what I shall call, in the broad sense, business analysis. Suppose, for example, that the management of a plant becomes aware that it is not making money, even though it disposes of its product. The important question is: Why?

Before the day of complete information, the attempted remedy often was an attack on the wage scale. The constant out-go of dollars to meet direct and indirect labor costs was visible. No one could fail to see it. In reality, many other factors may contribute to excessive costs, such as the improper purchase of material or selection of equipment, improper handling of material after it comes to the plant, inefficient methods in production, bad working conditions, or other items that might be named at length. These cannot be discovered until all the facts are gathered and analyzed. Records are the starting point for an analysis of the work which is going on under your direction. A score of elements may contribute to the lack of success in the operation of a department, and to remedy the condition, the facts must be gathered in a detailed and systematic way before their relationship to the situation can be established.

A second line of thought to keep in mind is that systematic planning can be done only with the aid of records.

Regardless of whether or not production includes a great many variables, a plan must be made. Then, if the unlooked for occurs, it can be fitted into the plan and work can proceed far more successfully than it could with no plan at all.

It is true that we cannot know the future; but we know the past, and what happened last week or last year is likely to happen again. The man who is willing to accumulate enough details of actual happenings in his work, over a sufficient time, can almost definitely forsee what is likely to confront him, and be prepared to meet the emergencies.

In the third place, it is important that we shall be able to test our methods of work.

Test Your Methods With Facts

Test your methods of work by securing facts relating to them. What do the results show in actual figures as compared with some other methods? When you buy a machine you buy it on its record. You want to know what it does and how. You can test your methods in the same way. Test your methods of work by the records you keep in your plant. Study them to see what lies back of them, and you will find their weaknesses.

Finally, your records can and should be used to stimulate the personal efficiency of the ordinary worker and department. Stimulate efficiency by bringing before the men facts that bear directly upon their work; by establishing standards of individual accomplishment, and comparing with those standards the actual accomplishment.

It is entirely possible to unite 2,000 or more employees of a plant in an enthusiastic, earnest, concentrated effort to reach a certain goal set before them as desirable for the entire plant. I have seen it done; I have seen the entire working force of a plant filled with enthusiasm over the idea of accomplishing definite results that were

presented to it as desirable, possible, and really worthwhile.

All of this leads back, not to the mere keeping of records, which we must do, but to the use that is made of the records we keep, and to their essential value in the work that modern production executives have in hand. It is my belief that a real opportunity exists for progress in having records supplied to all executives in a way that will make their interpretation easier. When this is done, and vital matters are discussed in their relationship to one another, the sub-executive will have a new viewpoint, and a new attitude toward record systems will be found.

Chain Drives and Their Industrial Applications

By A. C. Woodbury
Society of Automotive Engineers, Inc.

ROLLER and link chains are useful in special machinery, and a great field has been found for the use of silent-chain drives in transmitting power in industry. Variations in joint construction mark the chief differences between the various types of silent chains, and much ingenuity has been applied to produce joints that give the chain long life and smooth action.

Standardization of silent chains for industrial drives would be beneficial to the user. In the absence of such chain standardization, intra-plant standardization would be helpful.

The sliding type of joint seems to be more advantageous for use in chain drives where the lubrication will be ample. Several years ago, nearly all automobile front-end chain-drives were made with rocker-joint chains. These drives are given continuous lubrication from the oil-circulating system of the engine, and it is notable that joints of sliding types are being used much more than formerly in this service.

With exceptionally high chain-speed, especially if the chain length is short and the sprockets are small, friction in the joints of the chain can produce an appreciable amount of heat. The rocking type of joint undoubtedly has less friction, and its use can be extended a little further in extreme cases. These considerations should be weighed in deciding between the two types of joint for a given application.

Accuracy Should Count

Consideration should be given also to the accuracy of the chains as manufactured, and to the durability as determined either by wear tests or by a comparison of the joint construction. In selecting a chain for equipment on a quantity of machines, it is practicable to conduct wear tests either on the actual machines or on a simple testing apparatus in which several chains may be driven in tandem over small sprockets of equal size, the power being transmitted from a motor through the several drives under test to a fan-brake, a generator or to some useful load. The various chains should be removed at regular intervals during the test, and measured by connecting them over two sprockets that are kept for the purpose, the amount of wear being determined by the increase in center distance between sprockets. During a running-in period of 50 to 100 hours, the wear in some of the chains will seem to be excessive, and the test to determine the rate of wear should be started only after this excessive-initial wear period has been passed. Lubrication conditions for such a test should be as nearly as possible such as can be reproduced in service.

If the main consideration in the drive is quiet and smooth running, it is best to select a chain having a pitch as short as practicable; but a chain of longer pitch and narrower width will transmit the same power at lower cost, under ordinary conditions. In general, the pitch is determined by the number of r.p.m. of the driver or the driven sprocket, whichever has the higher speed, and a sufficient width should be selected to transmit the power within the limits of pull recommended by the makers.

It has been determined by experiments that a given chain will stand a higher speed in ft. per min. on large sprockets than on small ones. It may not be safe to go too far in this direction, because unreasonably high chain-speed reduces the period of cooling between the times at which heat is imparted to the individual links of the chain by the friction of the joint in bending and by the impact between the chain and the sprocket. This suggests that a long chain that is well cooled, either by air or by copious lubrication, can run faster than a short one that is tightly encased and only occasionally lubricated.

Good provision for lubrication is important, and may often contribute enough to spell the difference between an unsatisfactory drive and a highly satisfactory one. Oil-cups of various types feeding inside the chain are good if they receive proper attention. They can be applied to machine-tools if the operator can be relied upon to turn them on and off as required and see that they are kept filled. Good lubrication can be secured in the ordinary lineshaft drive from a cup of the spring-lid type with a short pipe discharging oil through one or more small holes inside the chain. This cup should be filled with oil of approximately the consistency of 600*W* steam-cylinder oil, once or twice per week, while the chain is running. The oil will be well distributed throughout the chain and will keep it lubricated for several days.

Discs or rings dipping in oil are used to advantage for some high-speed drives. They produce a mist that distributes the lubricant to the chain, and the oiling may be made more copious by means of channels or other devices in the casing to collect the oil and conduct it to the chain in a stream.

Sometimes a chain can be well lubricated by having it dip slightly in oil as it runs, but it is not practicable to run a strand of chain at high speed under oil between the sprockets as the resulting friction produces excessive heat. Provision of an oil-retaining casing is difficult with any method of lubrication that produces an oil mist.

Cutting Heavy Material with the Blowpipe

IN CUTTING heavy material with the oxy-acetylene blowpipe, there is often a tendency to use oxygen pressure that is too high. Excessive pressure not only reduces the speed of cutting but may stop the cut altogether by forming a cavity in the center of the piece. Always adjust the oxygen pressure in accordance with the chart furnished by the blowpipe manufacturer. Such adjustment will insure maximum speed and efficiency.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

How About a Christmas Party?

"WHAT'S this talk I hear about Williams wanting to pull off a Christmas party?" began foreman Ed, as he "lit up" after his mid-day meal.

"Williams is in a sort of dilemma," answered his old friend and shopmate, Al. "He feels that there ought to be more sociability among the men and their families, which means that they ought to know each other better, and he thinks this might be a way to bring them together."

"But why spring it at Christmas. Everyone is busy with their own little family affairs about this time."

"That's true, Ed, and Williams knows it. But he says that the sort of Christmassy feeling we have about this time of year ought to help make the party a success. It's not an easy job to pull off, and Williams wants to do the best thing."

"Is it to be a company party or a men's party, Al?"

"I think I get what you mean. And that's another problem that Williams has in mind. He would rather have it a men's party, as you call it, but, of course, he wants the wives, children and sweethearts in on it, too. On the other hand he doesn't want it a cut-and-dried affair where the men feel obliged to come, and are in a mood to criticise everything that goes on."

"How did they run that Christmas party you told me about last year, Al? You seemed to think that went off with a bang."

"It did, and it was a big shop, too, over five hundred men. That was a company party, but a lot of the old timers in the shop steered it, and the company was not prominent at all, except in paying the bills.

"The company hired a big hall, had a big tree, a present for every kiddie of every man in the shop, and wound up with a dance. They had done it several times before, and had it down fine. Everyone seemed to have a good time. But I heard it wasn't as much of a success the first year when everybody felt strange about it."

"Seems to me that the men and their wives would enjoy it better if they ran it all themselves."

"Perhaps they might Ed. And Williams would much rather they did. But such things are a lot of work and expense and someone has to take the lead. All he wants to do is to steer enough to get the habit well started. It isn't to *give* anything to anyone, but it's to boost the feeling of good fellowship among the men."

"Williams is all right, Al, but he's tackling a tough job with a Christmas party. I'll boost it, of course, but I'm not so peppy about it. I'm afraid some of the men won't appreciate what's behind it all."

Is Ed wrong about the attitude of the men? Or is Williams right in thinking he can further a better feeling in the shop? Should the men or the firm run the party—or both?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Holding Back on Piecework

IT HAS been my experience that many workers fear a rate cut, and as a result limit their output, either by tucking away work for another day or by soldiering after producing what they consider a fair day's work. What is more, this condition has been observed to exist in a company that maintains a rigid policy of never changing a rate unless changes in method are put into force.

The whole question resolves itself into company policy and methods. Those concerns whose rates are based on estimates, are more than likely to have a fixed wage in mind above which they do not intend any group of workers to go. This limit is soon known to everyone through rate-cutting, and as a result, the employees will work to a point just below this limit. Most new employees are coached on this fact and often threatened. All inevitably settle down to a jog-trot just inside that limit.

—JOHN KOLLARIK.

I RATHER think that Bill's experience is unusual. For such a thing to be possible to any great extent, would imply a degree of working together on the part of the men that is impossible to attain even in a useful way. Men in the mass have a pretty good sense of fair play. While they would not necessarily squeal on the man holding back, it is my experience that they would inwardly resent it, and handicap the perpetration in many indirect ways. Besides, in any group there are always enough men who will honestly do all they can, and sort of stand out in production from the rest of the group, that the danger of setting a high maximum for a normal day's work exists anyhow. —JOHN D. DYER.

Letting Good Men Get Away

MOST men are satisfied without promises for advancement provided the job pays a rate commensurate with their ability. If any one man feels that he can do better on the outside, he should by all means do so. Waiting for an opening is a painful task, and usually disappointing.

If there is no possibility of Tom Bristol going to the erecting gang for a while, it would be well to lay the cards on the table. Rather lose a good man by telling the truth than to kid him along. —WALTER W. YAEGER.

A STRIKING example of the difficulty of fulfilling promises as to future promotions was recently illustrated by a manager when hiring a foreman. He said that his promise was only good while he lived and was manager, and so held no real guarantee against future events. A young man must decide either to stay with one concern that usually promotes from within, or move about to positions that seem to be a step forward. This latter method is often more rapid, but also involves greater risks as it requires making good with each new employer. —L. F. SWANSON.

THE · NEXT · TOPIC

Gang Bonus in the Shop

ADVANCE QUESTION

A neighboring shop has cut out individual piece work and is trying the gang bonus. Ed thinks the plan cuts out all individuality, and he doesn't like it. Al thinks it has good points. What are the real benefits?

Reading the Shop Language

I CANNOT agree that it is necesary for every operator on the permanent staff to be given a course in blueprint reading. It is the foreman's duty, with his assistants, to educate these fellows gradually to the point of reading the average shop print or sketch.

As to leaving a sketch with the operator, it is the foreman's duty to know with whom to leave a sketch. If he is not sure the operator understands it thoroughly, then it is his duty to go over the sketch or blueprint with him, before leaving him to go ahead with the work. It is an easy matter to tell someone to do something, but getting it done correctly is the real problem.

—R. Q. TARBUTTON.

Equipment and the Foreman's Reputation

INSTEAD of quitting the job, Bill Jenks should have kept on, even though it would have meant using bad machine equipment. The showdown will come when mounting production costs point an accusing finger at the inferior equipment. The foreman's reputation could be vindicated, by presenting evidence to the boss on the evil arising from the use of this defective equipment.

Perhaps the management does not see its way clear in scrapping the machines in use and buying new ones. Before quitting, it would be a better plan to hear what management has to say about the matter, and what reasons are advanced against the purchase of new machines.

The foreman's loyalty should lead him to seek the facts in the matter before assuming any biased attitude. The management may have good reasons, from a financial standpoint, for not installing new machines, or it may not be aware of the effect that the inferior equipment has upon production. —G. H. GUNN.

IDEAS · FROM · PRACTICAL · MEN

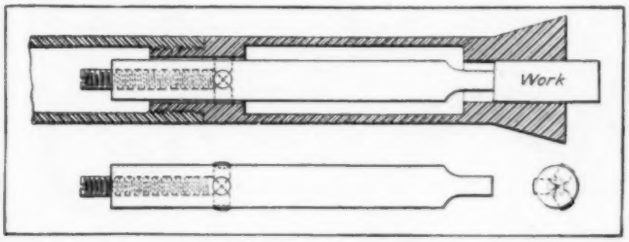
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Stock Stop for Use in a Spring Collet

By A. D. Seeds

The illustration shows a stock stop for use in the ordinary spring collet. It is made from a piece of round cold-rolled steel, of a diameter and length to suit the collet and the work.

The stop is held in the collet by three radial pins,



Stop for a spring collet

beveled on their inner ends. The pins are expanded by a pointed screw at the rear. By this means, the stop can be held in any position in the collet after it has been adjusted to suit the work. The front end of the stop should be turned to a size that will permit it to enter the nose of the collet, so that it will answer for short work.

Welded Rack for Pipe and Bars

By Harvey L. Brewster

While making an inventory, our shop welder devised a method of making the stock of pipes and bars readily accessible. He took several lengths of pipe and joined them to make a framework, as shown in Fig. 1, and then torch-welded them together. The members for supporting the pipe and bars were made from short lengths of pipe and welded in place. The cost of the rack was

Fig. 1—Stock rack made by welding

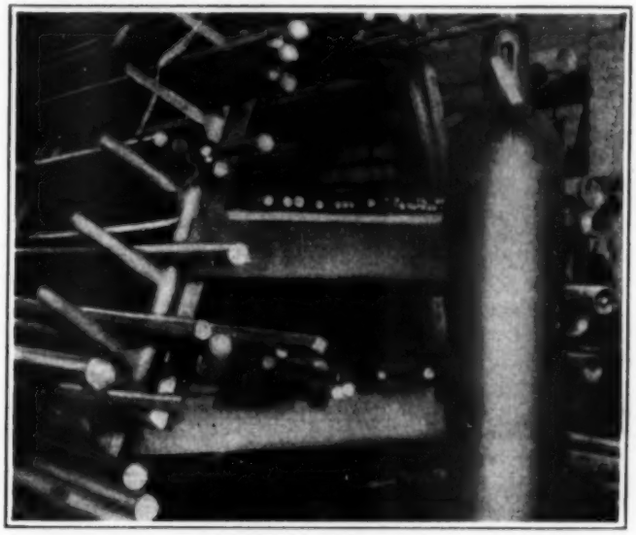


Fig. 2—End of rack showing wooden framework

negligible, because the pipe used for the uprights and the supporting members was entirely scrap material.

A wooden framework was made and fitted between the pipe standards as shown in Fig. 2. Boards were placed between the end pieces for holding the shorter lengths of pipe and bar stock. The resulting rack was not only neat, handy and accessible, but prevented untidiness by having all the stock in place and a place for all the stock. Steel bars and pipe are now kept in the rack, graded according to size or shape. It is the work of but a minute or two to pick out the necessary items.

An Improved Triangle—*Discussion*

By Francis M. Weston

As an old timer with more than twenty years' experience on the drafting board, permit me to make a few comments on the article by A. Gentner, under the title given above, on page 595, Vol. 69, of the *American Machinist*.

Every draftsman at some time in his career brings forth some sure-fire method for preventing ink from running back under his triangle and smearing his work. Some of these methods are successful, but only at the expense of introducing a new trouble that did not exist before.

Supporting the triangle on the heads of three thumbtacks, as suggested by Mr. Gentner, localizes the rubbing effect of the triangle to three spots and subjects the tracing to more damage than would the erasure of an occasional blot. Also, I doubt if any but a very small triangle could be supported so that the necessary pressure

of the hand to hold it in place would not cause it to sag in the middle and touch the drawing anyway.

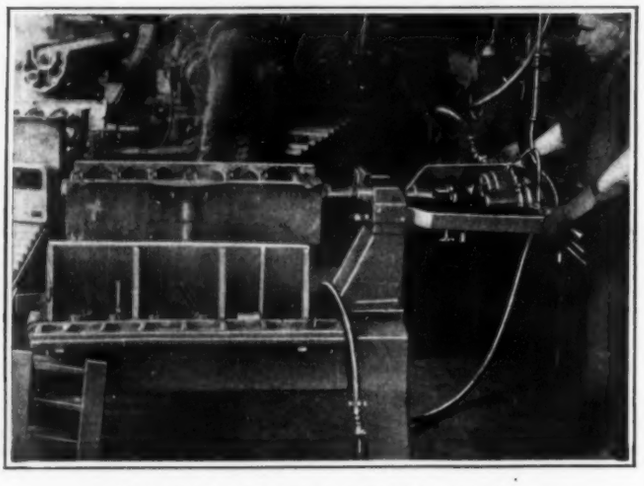
The cause of ink running from the pen under the edge of the triangle is the presence of almost invisible particles of dust and lint on the drawing. The frequent use of a counter brush minimizes the danger from this source, but it is indeed seldom that a draftsman can complete even a fair sized drawing without a single blot. No matter what mechanical aids are used the avoidance of blots depends upon critical watchfulness coupled with the ability to "blow dry." These qualifications, together with unflagging optimism and constant prayer, are the price of a blotless drawing.

Fixtures for Reaming Bearings

By I. B. Rich

The final reaming of bearings, which it was formerly considered necessary to do by hand, is now done by power in almost all shops. Air motors seem to be favorites in this kind of work and as they are rather heavy, varying means are used for supporting them so as to relieve the operator of unnecessary labor.

The method shown is that used in the shop of the Continental Motors Company in which a stand is provided to hold the cylinder blocks while two projecting arms prevent the motor from rotating. The motor is supported by a counterweighted cable and is easily brought into position. By confining the motors between these arms the operator is relieved of most of his labor and the counterweight makes it easy for him to remove the motor when it becomes necessary. The final reaming of the main bearings is done on this machine.



Support for air motors used in reaming

A Dinking Die for Flexible Couplings

By Geo. T. Kerr

The couplings *A* and *B*, Fig. 1, are made of alternate layers of rubber and cloth ½-in. thick. The usual procedure is to cut them from the sheet by means of a trepanning tool. The photograph shows the finished products at *A* and *B*, together with the scrap *C*, *D* and *E*. As we had about 1,000 pieces to make, we designed the die shown in Fig. 2. This tool makes the piece *B*. The die for the piece *A* is identical in design and operation, but contains more piercing punches. Both parts could have been made in the same die and at one operation, but more pieces of part *A* than of part *B* Fig. 1, were required; hence, two separate dies were made.

Parts *C* and *D*, Fig. 2, were cut out of 1¼-in. plate with the oxygen torch. Part *E* was forged in the blacksmith shop and the three were arc-welded together to form what would ordinarily be a casting. The outer cutting die *H* was made of oil-hardening steel and was acetylene welded with vanadium-steel welding rod. The heavy black triangle in the view at the left shows the weld metal. The ring was thoroughly pack-annealed in charcoal. The annealing caused the weld metal to absorb some of the properties of the tool steel. After annealing, the piece was machined, hardened and ground. The inside die *J* was made from solid stock. The knock-out strippers *K* and *L* operated from a knock-out bar acting on *M* on the up stroke of the press ram. Stripper *N* is operated by a spring. The two types of strippers were used to separate the several slugs from the piercing punches. The piercing punches are held in by nuts for ease of removal for grinding or replacing. The scrap pieces are ejected at different positions of the ram and are not pressed back into the stock, as would be the case if all were stripped from the die at the same time.

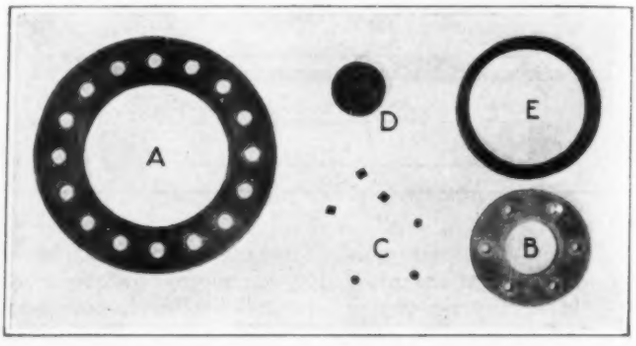


Fig. 1—The pieces cut out, and the scrap

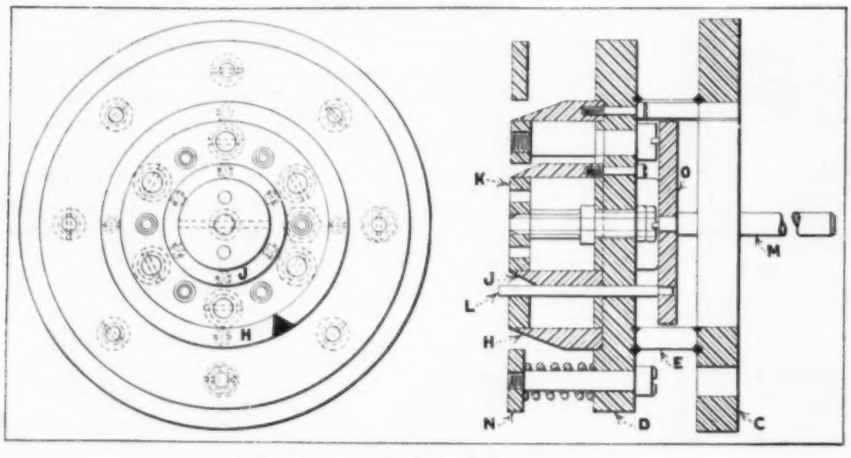


Fig. 2—Constructional details of the die

The six knock-out pins are all mounted on plate *O* and operate together.

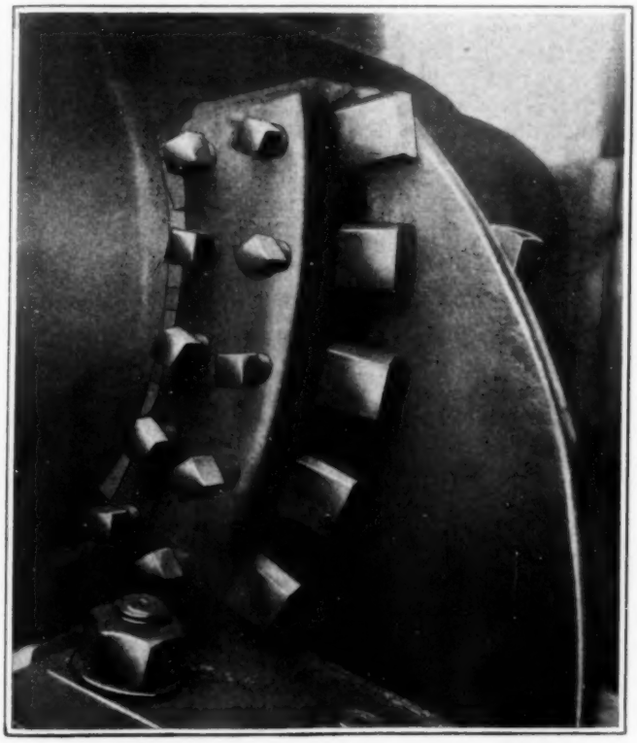
Piece *B*, Fig. 1, is made from the center of piece *A*, and ring *E* is the waste from the outside.

The cutting board is a block of maple about 2 ft. square and 6 in. thick, made up of 1-in. pieces bolted together. The top and bottom of the block present an end grain to the cutting tools. The block has to be shifted slightly about every tenth piece, and all stops or guides for the stock must be independent of the block.

A Multiple Toolholder for Lathe Work

By George H. Feltner

At the plant of the Miehle Printing Press & Manufacturing Company, Chicago, large cylinders and rolls, made of semi-steel castings, are rough turned in lathes equipped with gang toolholders, such as the one illustrated. Five ¾x1¼-in. tools are arranged radially and in steps in the holder, so that each tool takes one-fifth of the cut. The roll shown is 18 in. in diameter and is turned at 5 r.p.m., with a feed of ⅜-in. per revolution. The depth of cut is from ⅜ to ½ in. The cutting time is reduced, since the cut is distributed among five tools instead of one.



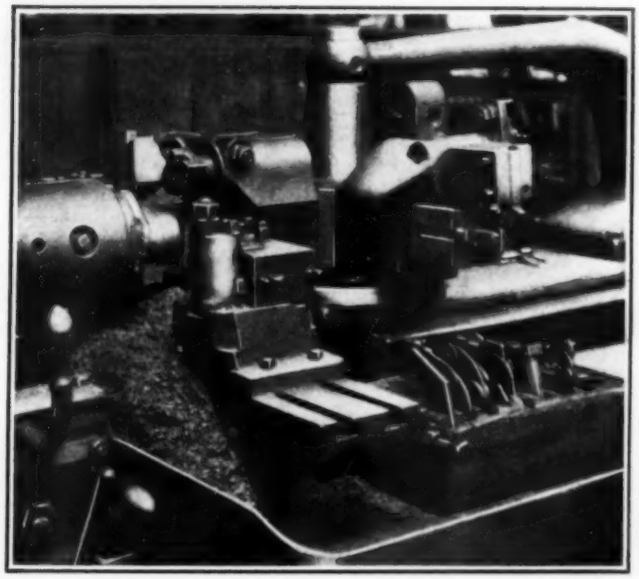
A gang tool for turning printing press cylinders

Inspecting Work at the Machine

By Francis C. Henry

Practice varies widely as to inspection in the modern shop. In some plants, the machine operator makes practically no inspection of the work as turned out. In such shops the inspector checks the first piece and gives his O.K. for the operator to go ahead. Occasional checking for tool wear or adjustment is depended on to keep the product uniform.

Some shops, on the other hand, depend very largely on the operator to inspect his own product, even though it is finally checked by the inspection department. In cases of this kind, it is something of a problem to know how to handle the gages necessary for a given piece, and the illustration shows how the Yellow Sleeve-Valve Engine Company meets the question of supplying gages to the machine operators. The piece is the cylinder head for a sleeve-valve engine, and the number of gages shown in the box in front of the machine indicates the number of points to be gaged by the operator. This box of gages is kept in the toolcrib and is checked out as needed



Handling inspection gages on the machine

Fitting Pistons in Cylinders

By Frank C. Hudson

The illustration shows just how steel feeler strips are used in connection with fitting pistons in cylinder blocks. The pistons are handled by tongs, the ends of which fit in the piston-pin holes from inside the piston bosses.

In the position shown, the ends of the tongs are in the hole and the handles are closed together so as to enable a good grip to be obtained in moving the piston in the cylinder bore. This form of tongs with the bent handles, together with the steel feeler strip, having the end fitted for a finger pull, makes a very convenient combination.

Tongs and feeler for fitting pistons

· BOOK · REVIEWS ·

LAWS OF MANAGEMENT APPLIED TO MANUFACTURING. By L. P. Alford. Two hundred sixty-six pages, $5\frac{3}{4}$x$8\frac{1}{2}$ in., cloth board covers. Indexed. Published by the Ronald Press Company, New York, N. Y. Price $4.

A MUCH-DISCUSSED paper on the laws of manufacturing management, presented by the author at the annual meeting of the American Society of Mechanical Engineers, in December, 1926, forms the basis of this book. It comprises about fifty laws of management, gathered together by the author over a period of research, and his original discussion as presented in the paper has been enlarged and numerous examples have been given.

Most of these fundamental laws of management have been well established and recognized by industrial engineers, but this is the first time that they have been assembled and analyzed. The book contains thirteen chapters, with the laws grouped together systematically for better discussion. Numerous examples have been given from the practice of well known manufacturing organizations. Some of the laws discussed at length are those of leadership, executive work, wage payment, standardization, production management, safety, maintenance, and economy. In the final chapter, on "The spirit of the laws," the author has given a comparison of the old methods of obtaining work by driving labor with the very modern idea of bettering methods and management in order to obtain better results. The book is one in which every executive will find much material for consideration.

1928 SUPPLEMENT TO BOOK OF A.S.T.M. STANDARDS. One hundred and ninety-five pages, 6x9 in. Paper covers. Published by the American Society for Testing Materials, Philadelphia, Pa. Price $1.50.

THE 1928 supplement to the A.S.T.M. book of standards contains ten revised and thirty-one newly adopted standards, thirteen relating to metallic materials, and twenty-eight to non-metallic materials. The arrangement is such that either the metallic or the non-metallic sections may be separated from the pamphlet if desired. Among the revised standards are those on carbon-steel and alloy-steel forgings; and among those newly adopted are the standards on alloy tool steel, aluminum-bronze castings, yellow brass sand castings, and brazing solder.

IMPURITIES IN METALS: THEIR INFLUENCE ON STRUCTURE AND PROPERTIES. By Colin J. Smithells, Member of the Research Staff of the General Electric Company, Ltd. One hundred and fifty-seven pages, 6x$9\frac{3}{4}$ in.; one hundred sixty-six illustrations, and twenty-seven tables. Published by John Wiley & Sons, Inc., New York, N. Y. Price $5.

"MINOR CONSTITUENTS," which the author states is the title he would have preferred if he had felt sure that its meaning would be clear, is quite as descriptive of the content of the book as the real title. The influence of these minor constituents on structure, mechanical properties, electrical properties, and corrosion, forms the body of the book. For instance, information on the effect of composition on the grain size of nickel-chromium alloys, the copper-oxygen equilibrium diagram, the solubility of hydrogen and nitrogen in iron, the effect of nickel on the tensile strength of cast irons of various silicon contents, the effect of oxygen on the conductivity of copper, and the temperatures at which sulphuric acid attacks commercial lead containing 0.2 per cent of various elements, has been collected in this volume. The first third of the book is devoted to methods of studying the structure of metals, X-rays and the structure of metals, and the structure of pure metals and alloys.

PRODUCTION DESIGN. By J. K. Olsen, M.E. Two hundred twelve pages, 6x9 in., cloth-board covers. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $3.

CO-ORDINATION between the designer and the production engineer who is to make the product is an essential requirement, if manufacturing economies are to be attained. Specifications should be precise and complete, so that no details are left to someone's judgment. With this requirement as basic, the author points out that ordinary drawings are not suited for production purposes. A compilation of production-design problems of a representative nature shows the fundamental principles through which a product can be bettered by means of design changes. To meet conditions of highly-competitive markets requires a combination of modern methods and equipment, and production-design ability.

Seventeen chapters, fully illustrated, include information pertaining to production specifications, various forms of fits, swaging and heading allowances, gearing, stamping and die-made parts, fastening, locking and compensation means, screw threads, raw materials, heat-treatment and finishes. Inclusion is made of thread terminology and tables showing miscellaneous dimensions covering the most important thread series.

The author points out characteristic features of a variety of materials, their uses and applications. Good design, as outlined, means specifications that enable a product to be made with the least waste and at a minimum cost. Therefore, the conservation of raw material is gained through the application of good designing. Production design is an art usually mastered through long experience, but it is the aim of the author in presenting the volume to provide essential information that will substitute some of the long experience that is otherwise required to solve manufacturing problems.

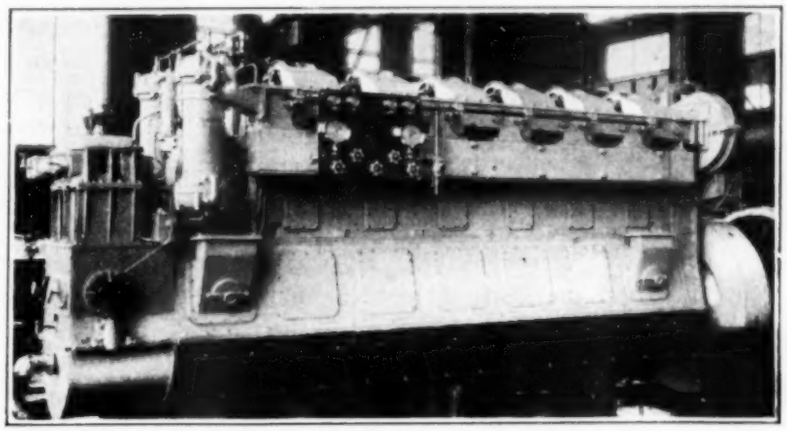
ECONOMICS: PRINCIPLES AND INTERPRETATION. By Roy Emerson Curtis, Professor of Economics, University of Missouri. Eight hundred and seventy-nine pages, 6x9 in. Buckram binding. Published by the A. W. Shaw Book Division of the McGraw-Hill Book Co., Chicago, Ill. Price $4.50.

THAT all problems of economic life are the problems of human beings, is the viewpoint with which the author has written this book. It is intended, not so much to show how Wall Street works, as to give a picture of life as affected by economic principles. Such questions as why do prices rise and fall, is of interest to all of us. The treatment is suitable for those of mature mind who undertake the study for the first time, and yet it aims to be complete enough for those who will carry the study no further. The main sections, which are as follows: production, consumption, the market and price, money and credit, finance, commerce, risk, distribution, personnel, and reorganization, have a message for those who are interested in the organization of people for productive activity.

Engineering Materials Analyses

Winton 10x16-in. Oil Engine

How many of the parts entering into a machine are purchased? What are the materials used in its construction? As applied to machine tools, and other construction equipment, these questions have been answered through the Shop Equipment News Section. But what of other types of equipment? In a series of handy Reference Book Sheets, of which this is the first, the same sort of information, but in more condensed form, will be provided. Comments on its value, and criticisms of its presentation, will be welcomed.



Aluminum and Light Alloys

ALUMINUM CASTINGS—135 parts, including gear housings, pump housings, cover plates, and brackets.

DIE CASTINGS—32 parts, for bearing bushings.

ALUMINUM ALLOY—30 parts, including pistons, piston bearings, and wrist pin caps.

Brass

RED BRASS—68 parts, including spring cases, valve handwheels, brackets, packing nuts, strainers.

ROD—213 parts, including packing nuts and glands, gage valve handwheels.

SHEET—14 parts, including shims for bearings.

TUBING—29 parts, including air cover tubes.

Bronze

ALUMINUM BRONZE—6 parts, including fuel pump plunger cross heads.

CHROMIUM BRONZE—13 parts, including air distributor bodies, distributor valve caps, and idler gear.

WIRE MESH—8 parts, for oil filter tank strainers.

GUN METAL—27 parts, including air shut-off valve bodies.

MANGANESE BRONZE—60 parts, including connecting rod boxes, air cooler, packing retainers, wrenches, connecting links.

NAVAL BRONZE—176 parts, including water and oil pump crossheads, packing glands, bushings, caps, links.

NICKEL BRONZE—6 parts, for fuel test valve bodies.

TOBIN BRONZE—8 parts, including fuel pump eccentric strap bushings, and oil pump valve studs.

Copper and Cupro-Nickel

SHEET COPPER—13 parts, including gaskets, and injection valve seats.

COPPER TUBING—55 parts, for air, oil, and water lines.

CUPRO-NICKEL—2 parts, for water and oil pump rods.

Iron

CAST IRON—218 parts, including cylinder block, heads, rails, crankcase, pump bodies, flywheel, manifold, cover plates, pump pistons.

BLACK IRON—107 parts, including cylinder head plugs, pipe fittings.

Steel

No. 1020 CARBON STEEL—3,312 parts, including screw fastenings, washers, pins, small shafts, collars, eccentrics, stuffing boxes, rollers, safety valves, plugs, glands, clamp plates.

CAST STEEL—37 parts, including valve levers, air compressor counterweights, valve clamps.

CHROME-VANADIUM STEEL—168 parts, including injection valve stems, safety valves, inlet and exhaust valves, injection valves.

FORGINGS—56 parts, including connecting rods, crankshafts, couplings.

MOLYBDENUM STEEL—24 parts, including valve cams.

NICKEL STEEL—12 parts, including valves for air starter and distributor.

SPECIAL STEELS—216 parts, including wrist pins, engine tie bolts, cylinder head studs, main bearings, compressor cylinder head, inlet and exhaust valves.

SEAMLESS TUBING—22 parts, including collars, sleeves, and socket wrenches.

Purchased Parts

COPPER-ASBESTOS GASKETS—137 parts, for engine cylinder heads, valve caps, air coolers, fuel pumps.

PAPER GASKETS—6 parts, for cylinder lines to block.

RUBBER PACKING—66 parts, for by-pass tubing and cylinder liner.

COMPOSITION PACKING—18 parts, for fuel pump, and injector valves.

PISTON RINGS—41 parts, for engine, dash pot, and oil pump.

COMPOSITION SHIMS—32 parts, for connecting rod boxes on engine and pumps.

VALVE DISKS—32 parts, for water and oil pumps.

Purchased Units

GAGES—6 units, for cylinders, starting air pressure, fuel oil, and lubricating oil.

GOVERNOR—1 unit, for engine control.

PIPE FITTINGS—56 units, for high-pressure air cooler, air bottle connections, and wire lines.

MECHANICAL LUBRICATORS—2 units, for engine lubrication.

OIL COOLER—1 unit, for lubricating oil.

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Are Engineers People?

ALTHOUGH most of the readers of this editorial are engineers of some sort or other, and consequently consider themselves as men first and engineers afterward, they ought to know what is stirring in the minds of men in other walks of life. Strange as it may seem to them, engineers are unquestionably being looked upon askance in certain quarters and it is their duty to rise up and deny the untrue allegations made against them.

Two examples of this strange suspicion of the engineer will suffice to show what is going on in the minds of other men. One is found in the post-election editorial of the New York Times, which is but a reflection of many of the attacks made on Herbert Hoover during the campaign. One sentence shows what is in the writer's mind. "Hereafter it will be his opportunity to prove to the people that they have sent to the White House, not merely a practical engineer, but a full rounded man equal to the great task laid upon him both at home and abroad."

From that sentence it is clear that practical engineers must not be considered as full rounded. There is evidently something lacking in their make-up, something human and friendly that is found in other men. As one man put it, they are human adding machines.

To get the other instance we must go to Princeton University, famous for its high academic standing in philosophy and the classics, and recently in science. It has an engineering school for which a new laboratory was recently dedicated. Its aim has been, and still is, to train young men to be engineers, not only sound in their technical foundation but broadened by their contact with university culture as well.

Here again we get the outside point of view from an editor, this time a boy on the staff of the college daily, and one well schooled in the academic tradition, if we can judge from his writing. Truly reflecting the attitude of his mentors he makes the positive statement that there is no place in the university for a school that trains engineers in efficiency only, that they must secure culture as well. It might be inferred, a trifle maliciously, that when engineering efficiency threatens academic inefficiency out must go the engineer.

But, seriously, these two editorials show clearly that there is entirely too general a feeling that engineers deal only with materials and machinery, and that they have a blind side where human beings are concerned.

How far this last assumption is justified is evident from the fight-to-the-death spirit with which men who have served under Herbert Hoover have carried out his orders. Perhaps his case is exceptional, but it is that of an engineer.

There seems to be but one way for engineers to break down the suspicion with which the mind trained in older methods of thought regards anything so new and different as the accurate thought processes of the engineer. That way lies through closer contacts between engineers and those who are forming public opinion, and the abandoning of the reserve which has kept the enginear too long from telling of his work.

Reactionary Leadership

PRESIDENT Green of the American Federation of Labor announces to the world in his address to his fellow members at New Orleans that one of the policies of the Federation will be to fight the replacement of human labor by machinery. Such a statement is not only reactionary to the last degree but an unmistakable threat of economic suicide as well. Apparently Mr. Green is one of those who believe that the action of economic laws can be ignored. He should take warning from the fate of others who have held similar views and have put them to the test.

If Mr. Green or his organization would take the stand that it was their duty to do everything possible to ameliorate conditions during the transition period that occurs after a replacement, and before all of the displaced workers have been reabsorbed, no one could find fault. Such a condition is sure to exist if changes are made too suddenly. The modern employer recognizes this fact and with few exceptions is doing what he can to prevent hardship. How much better it would be for the labor unionists to be frank in their recognition of the inevitability of industrial mechanization, and to do their part in making it as painless as possible. American labor people, in particular, have in their own experience the best example of the ultimate benefits of substituting machinery for human muscle. Why fight it?

Bradford "Low Drive" 42- and 48-Inch, All-Geared, Motor-Driven Lathes

COMPLETE redesign of the 42- and 48-in. heavy-duty, all-geared motor-driven lathes has been made by the Bradford Machine Tool Company, 657 Evans St., Cincinnati, Ohio. The resulting machines are of very heavy and powerful construction. As shown in Fig. 1, the bed is of the deep-girder, planer-type construction, with the feet cast integral thereon. The metal in the bed, as well as the head, tailstock, carriage, and rests, is proportioned with the view of obtaining proper distribution of mass in order to meet the stresses imposed.

The all-geared transmission, part of which can be seen in Fig. 2, is three times as heavy as usual construction, according to the manufacturer. About two-thirds of the Bradford all-geared drive is placed entirely under the head and down in the bed, where the six selective initial speed changes are controlled and locked by a single lever. From the speed change gears, power is transmitted by means of a heavy flexible chain up to the initial drive in the lower front part of the head. The pull down on the chain is a factor in securing rigidity between the head and the bed.

The head carries a backgear drive and a triple or faceplate drive in addition to the direct drive for the spindle. As already stated, about two-thirds of the spindle drive from the motor is outside the head. This construction permits a tumbler to be used for the feeds and threads, as well as a mechanism having the two coarse screw ratios of 4 and 20, which increase materially the thread and feed range listed on the regular index plate. A lead of 20 in. is available. Eighteen forward and reverse spindle speeds, from $1\frac{1}{2}$ to 175 r.p.m., are provided. When the drive to the spindle is disengaged, the spindle brake acts automatically. A single shift of a large lever controls the faceplate drive by putting the pinion into or out of mesh with the internal face gear. With the faceplate drive engaged, the operator uses the upper control entirely to stop, start, or reverse the spindle. Engagement of all the sliding gears, as well as the tumbler gears in the head, is effected without noise or chatter because of certain accident-proof features that prevent shifting of any of these gears under load.

Power rapid traverse is available for quickly traversing the carriage along the bed in either direction, and is also available to operate the carriage cross-feed screw, the toolrest, and the angular feed to the compound rest. The engagement of this motion simply requires the operator to hold down a lever at the carriage until the required movement is effected. An independent motor, as shown in Fig. 3, is provided at the tailstock end of the lathe for the power rapid-traverse movement.

Lubrication of all bearings is automatic, and the amount of lubricant fed to each bearing may be adjusted. An automatic pressure accumulator discharges oil at about 300 lb. per sq.in., at fixed time intervals as long as the lathe is running.

The lead screw is $2\frac{7}{16}$ in. in diam., and has one thread per in. It is not splined as it is used for thread cutting only. The lead of the screw is guaranteed to be accurate to within a limit

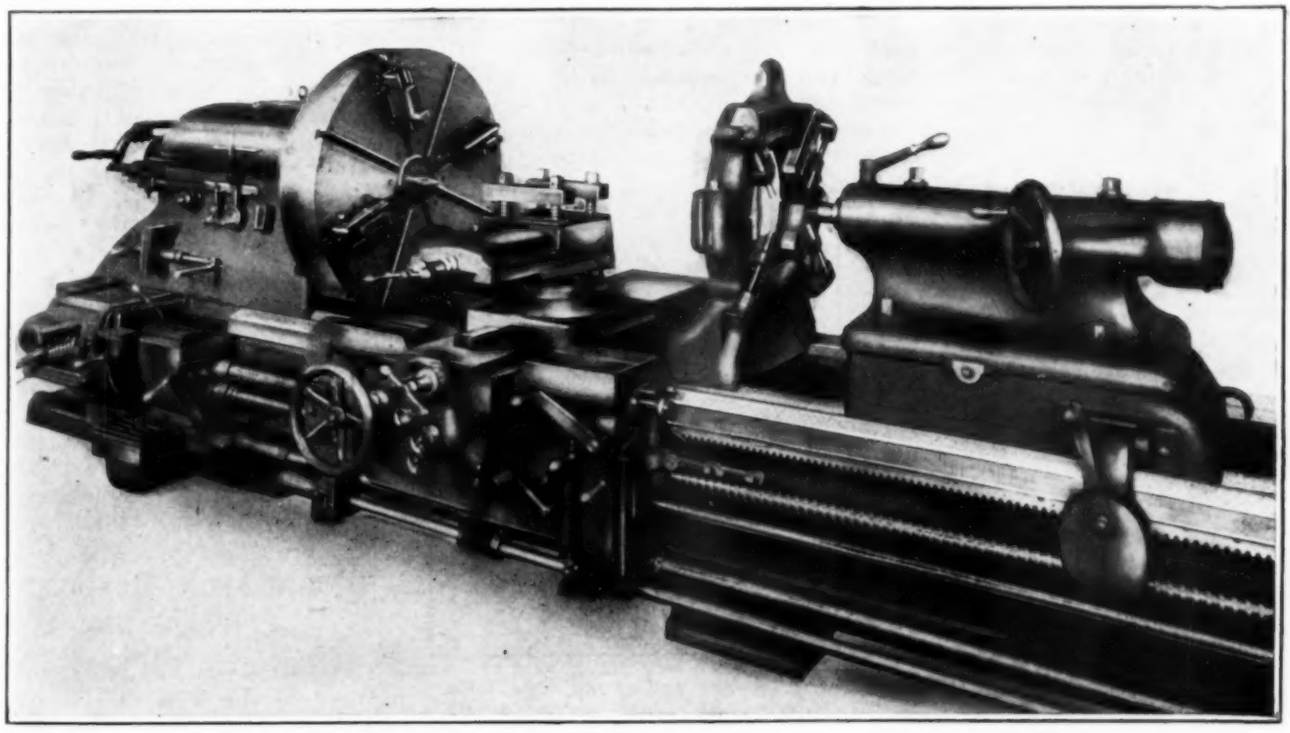


Fig. 1—Front view of the Bradford 42-Inch, "Low Drive," Heavy-Duty, All-Geared, Motor-Driven Lathe

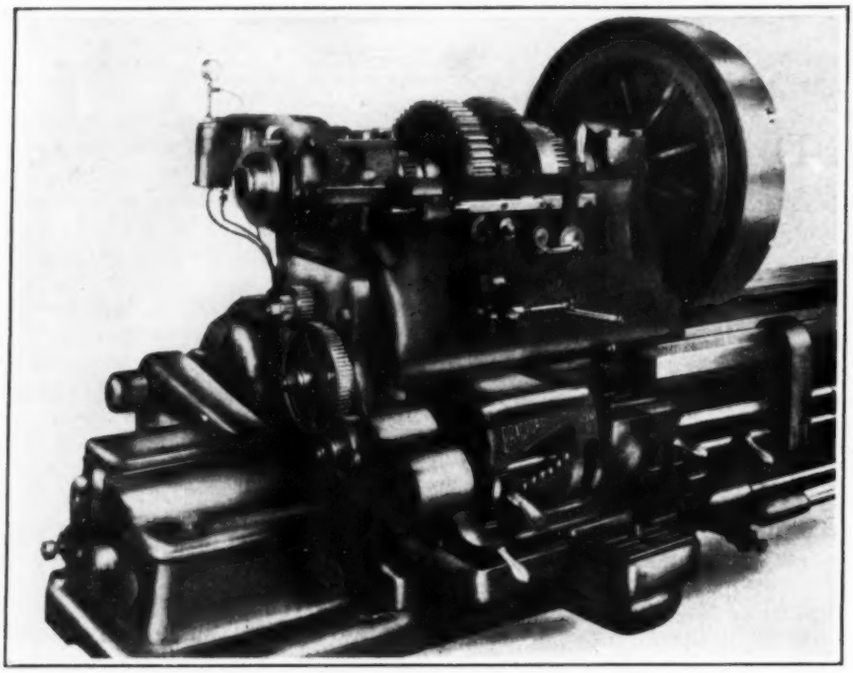


Fig. 2—View showing headstock of the 42-in. lathe with gear guards removed. From the motor, power is transmitted to a selective speed box and thence by chain to the head

of 0.001 in. in 18 in. for the full length of the thread. A special, hard, phosphor-bronze alloy is used for the tapered spindle bearings, which are hand scraped. The spindle journals, center, and bushings in the spindle nose are all ground, fitted and tested. The alignment of the centers is maintained even after making bearing adjustments for wear, due to the taper form of the bearings. The bearing adjustment is made by means of two collar nuts, which are easily accessible without removing the spindle-head caps or the bearings themselves. A large ball thrust bearing is provided to receive the spindle end thrust.

The apron with its gearing is designed so as to accommodate both the usual feeding and thread cutting motions as well as the power rapid traverse previously referred to. It is impossible to engage the power rapid traverse until after the disengagement of the power feed and vice-versa. Power feed and screw cutting are also impossible of simultaneous engagement. The quick-change gear provides threads from 1 to 56 per in., and feeds from 2 to 112 per in. Ordinary change gears can be used to cut any special thread required.

Power is furnished by a 25-hp. constant-speed motor, which runs continuously in one direction only. The starting and stopping are effected through a push-button station on the lathe head as shown in Fig. 1, or at any other convenient place, as desired.

With reference to the apron control, the independent starting, stopping and reversing of the lathe is effected by a lever at the carriage. The knob for engaging the power longitudinal feed, as well as the knob for engaging the power cross-feed, and the lever for engaging the half nuts

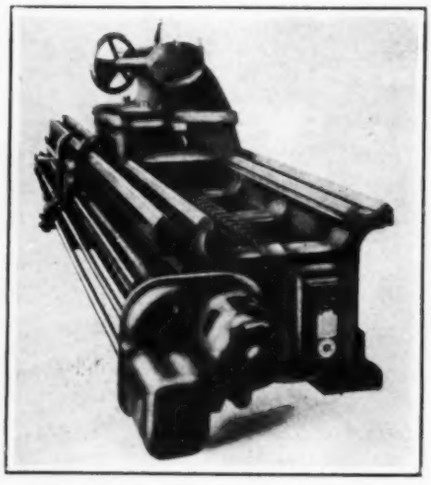


Fig. 3—Tail end of the 42-in. lathe showing individual motor for the power rapid traverse movements and the pawl rack for the tailstock

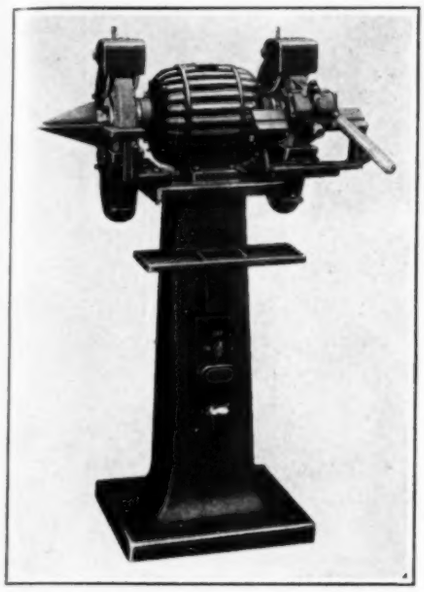
to the lead screw are also mounted on the carriage. Here also are found the reverse handle for the feeds and the rapid traverse lever. The feed rod cannot function as a drive unless the lead screw is disengaged from the half nuts. An automatic stop for the carriage is provided. A chasing dial is also located at the carriage and can be swung to an inoperative position when the lathe is not chasing threads. The lead screw and rod hangers are carefully fitted to carry the weight of these parts. The hangers are engaged and released by hooks attached to both sides of the traversing carriage in such a way that they are pushed or pulled along the outer bed Vs, and locate themselves automatically at fixed intervals so as to afford an adequate support. It is not necessary to locate these hangers by hand.

A handwheel located in a forward position at the tailstock allows the operator to center work or perform boring operations with a minimum of effort. This tailstock has been completely redesigned. A powerful conveyor for moving it back and forth is provided as shown in the illustration. The compound rest has also been redesigned. It is solidly gibbed with wearing surfaces of ample width. The base of this rest is graduated in degrees. Four heavy bolts are used to secure the center slide to the base slide. Various types of toolrests can be furnished. A taper turning attachment can be supplied when desired. The taper turning capacity is 6½ in. per ft., and is available the full distance between centers. An outboard support for the heavy taper attachment bar is supplied.

The steadyrest has an opening 18½ in. in diam., with adjustable screw jaws as part of the regular equipment. All adjustments are made easily and quickly. When so ordered, the lathe can be furnished with a taper attachment, follow and full swing rests, and extra gears and index plates for fine or coarse threads as well as for metric threads.

Blount Multi-Purpose Grinder

To meet the many different grinding needs arising in the wood or general shop, this grinder, having three wheels, has been placed on the market



Blount Multi-Purpose Grinder

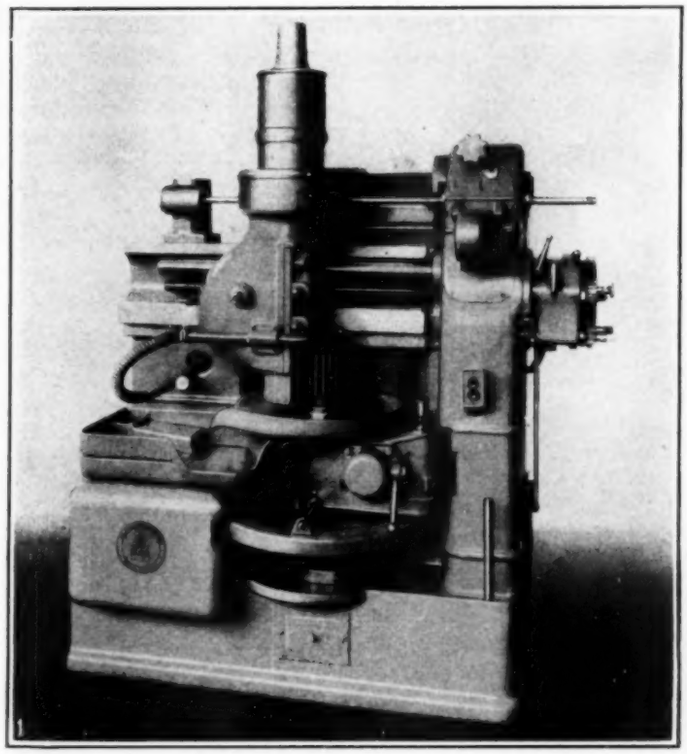
by the J. G. Blount Company, Everett, Mass. A coarse wheel 10x1½ in. is provided for general shop use, and on this wheel snagging or rough grinding can be done. A fine wheel of the same size is provided for the grinding of tools, chisels and plane irons. To facilitate these operations, the fine wheel is provided with a special rest, which is fully adjustable as to its angle with the wheel face. The rest is fitted with a special screw-feed, sliding-clamp block for holding the tool and guiding it across the wheel. This attachment permits the grinding of tools to correct angles and curvature. For the grinding of gages and inside curved tools, a grinding cone is provided at the left-hand end, as shown.

The machine is of the motor-in-head type, the motor being fully-inclosed and dustproof. The spindle is extra heavy and runs in heavy-duty, deep-groove ball bearings. Double recessing of the flanges provides a double seal against grit and dust entering either the bearings or the motor, which is of special design for this service. The wheels are fitted with fully-inclosing safety guards of an approved type, and are adjustable to wheel wear. The tool-rests are also adjustable.

Fellows No. 6A Gear Shaper

PRODUCTION cutting of both spur and helical internal and external gears can be done on this No. 6A gear shaper, which has been placed on the market by the Fellows Gear Shaper Company, Springfield, Vt. The machine, which is illustrated in Fig. 1, will cut external gears up to 18 in. pitch diam. with 5-in. face, and internal gears up to 18 in. pitch diam. with 3-in. face. It is of massive construction and contains several improvements not found on the No. 6 type manufactured by the company.

Among the features are the design of the apron and the drive to the cutter slide. The apron is operated by cams, and is positively controlled in both directions. It is held into the seat in the base positively by a cam, and is also withdrawn positively from its seat by a cam to relieve the work from the cutter on the return stroke. This mechanism is said to be quiet in operation. Power is transmitted from a single pulley to a change-gear box operated by interlocking levers, and thence direct to a massive crankshaft, which is designed to absorb any vibration. Four reciprocating speeds



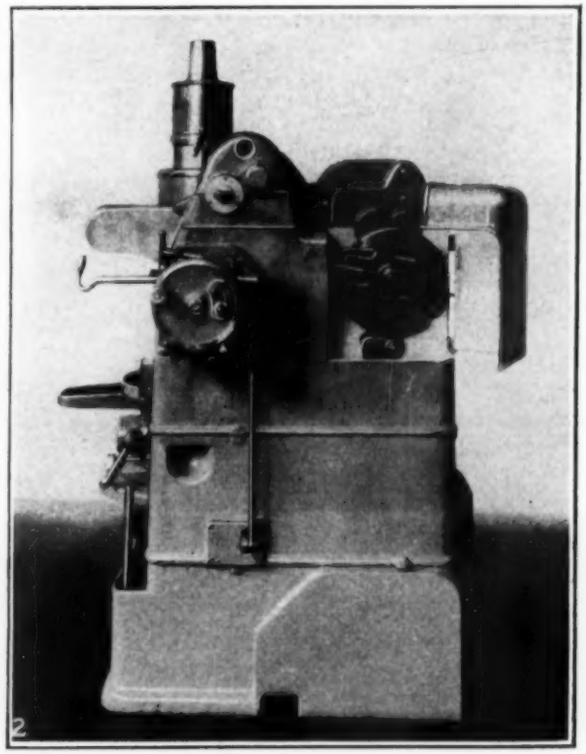


Fig. 1—Front view of the Fellows No. 6A Gear Shaper, showing method of supplying cutting compound to the cutter and work, and also the feed gearbox. Fig. 2—Right-hand end view of the gear shaper with guard open to show the drive connections

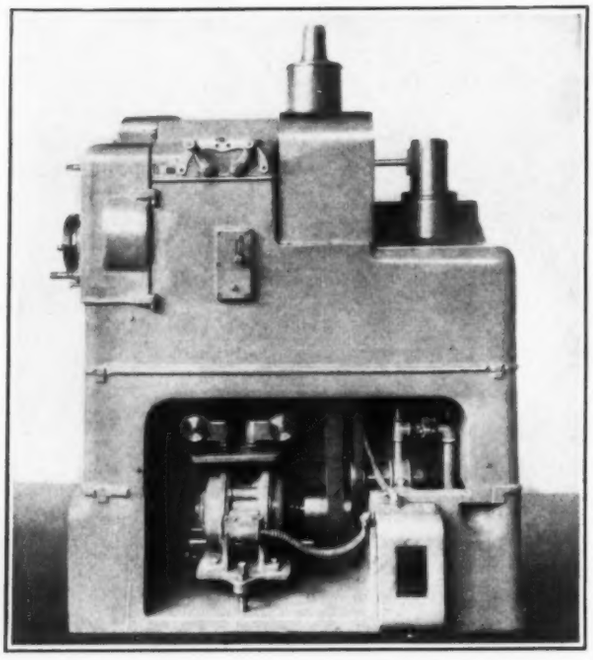


Fig. 3—Rear view of the No. 6A gear shaper with guard removed to show the motor drive, the relieving mechanism, cutting lubricant, pump, and feed control and shift levers

are provided, ranging from 111 to 400 strokes per min. The feed or rotative speed of the cutter and the work is also controlled by a change-gear box providing six different feeds ranging from 720 to 1,620 strokes of the cutter per revolution per min. Feeds can be selected when the machine is in operation.

All of the shafts rotating at high speed are mounted on ball bearings, and, in fact, ball bearings are used wherever their application is permissible. All high-speed shafts are lubricated automatically from a pump in the speed gearbox. The lubricant is pumped into the reservoir in the feed gearbox, and from there is fed by piping and wicks to the various bearings throughout the machine, with the exception of the saddle, which has a reservoir provided in the index-wheel housing that takes care of the lubrication of the reciprocating and rotating members in the saddle. All working members are completely inclosed either with removable or fixed guards to provide safety for the operator, and the machine has been so designed that all members requiring adjustment are of easy access.

Operation of the machine does not differ fundamentally from other gear shapers manufactured by the company. In addition to the features mentioned, certain improvements have been made over the so-called No. 6 machines in that the construction is more rigid and the machine is fully automatic in operation. The double-cut mechanism has been retained, but it has been made completely automatic, so that when the gear has made either one or two revolutions, depending upon the number of cuts to be taken, the machine is stopped automatically at the completion of the cut. The No. 6A gear shaper is adapted to motor drive, and a 3-hp. motor of the a.c. type is recommended. The main drive-shaft speed is 1,250 r.p.m., and an 1,800-r.p.m. motor is advised.

Three different styles of machine, known as Nos. 61A, 612A, and 615A, are manufactured. The No. 61A is adapted particularly for arbor work, since it has a removable sleeve in the work spindle and a cutter spindle adapted to holding cutters either 3 or 4 in. in pitch diam. The No. 612A machine has a large cutter spindle adapted only to 4-in. cutters with 1¼-in. holes. This machine is recommended for work of coarser mesh than the No. 61A. The No. 615A is adapted to cutting helical and herringbone internal and external gears, and uses helical cutters with 1¼-in. holes, or 4-in. spur cutters with 1¼-in. holes. Cutters 3 in. in diam. cannot be used on this machine. By simply changing the guides and the cutters, the 615A machine can also be adapted to the cutting of spur gears. The net weight of the machine in all types is approximately 5,800 pounds.

"hp Microhite" Hangers

Self-alignment of the bearings in the "**hp** Microhite" hangers is permitted by freedom to move both in the horizontal and vertical planes. The hanger has been developed by the Hardware Products Company, 103

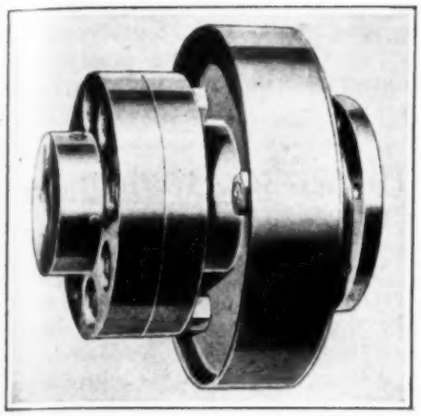
*"**hp** Microhite" Hanger*

Richmond St., Boston, Mass., but will be marketed exclusively by the Boston Gear Works Sales Company, Norfolk Downs, Mass. Stock sizes range from bores of ½ to 1 in., and heights to the center line from 3½ to 10½ in. The range of bearing lengths is 2 to 2½ in. Both ball or bronze bearings, which are interchangeable, may be obtained.

After rough height adjustment has been made by sliding the shank in the base and locking it therein by means of set screws, the fine adjustment is made by means of the knurled collar, which screws into the yoke. Both rough and fine lateral adjustments are made in the usual way by means of slotted holes in the base and the hanger screws.

James Combination Automatic Backstop and Flexible Coupling

Both the functions of automatic backstop to prevent reversal of travel and that of a flexible coupling are combined by this device, which has been placed on the market by the D. O. James Manufacturing Company, 1120 West Monroe St., Chicago, Ill. The device is designed especially for use on elevators, conveyors, and process equipment drives where there is the likelihood of reversal of travel after the equipment has been standing idle. The backstop is applied on the drive shaft between the speed reducer and motor. A flange, attached to the speed re-



James Combination Automatic Backstop and Flexible Coupling

ducer housing, is cast integral with the ratchet. The ratchet operates within a drum housing, which, in turn, is connected to the motor shaft through a flexible rubber bumper-type coupling. On the inner face of the housing, three pawls are secured by studs that engage the ratchet the moment the housing stops revolving.

The unit consists of a drum-shaped housing in the back of which is the half of the flexible coupling that contains free-flexing, live-rubber bumpers, in which Bound Brook oilless bushings are cemented. A half coupling fitted with hardened and ground steel pins which float inside of the graphite-impregnated bronze bushings, a ratchet plate, 3 pawls with studs, springs and fastening bolts, and a two-piece cover plate complete the unit.

Centrifugal force keeps the pawls out of engagement with the ratchet during operation, but should anything happen to the shaft or motor, or should the motor be shut off, the pawls engage the ratchet through gravity and provide a brake against reversal of travel of the elevator or driven machine

Bridgeport No. 74 Heavy-Duty Knife and Face Grinder

BECAUSE knife and face grinding requires a wide range of work speeds and automatic feeding due to the wide variations in hardness and surface conditions of the materials encountered, Oilgear table drive has been incorporated in this heavy-duty grinding machine. The No. 74 grinder has been announced by the Bridgeport Safety Emery Wheel Company, Inc., Bridgeport, Conn. It is built in table lengths of from 50 to 216 in., all sizes having a 22 in. width of table. A 26-in. sectional grinding wheel is used. In Fig. 1 the operating side of the machine is shown.

The work table operates on flat, self-oiling ways, 3½ in. wide. All thrust from the grinding wheel is taken against the broad flat side of the rear way. Means are provided to exclude grit from the ways as much as possible. Three T-slots are provided for holding the work. The oil pump which drives the work table is of the variable-delivery reversing type, and is piped to a reversible oil motor. This oil motor drives a short gear train in the bed. The gear train meshes with the work table rack. At table reversal, the flow of the oil is in the opposite direction through the circuit. This is done smoothly and uniformly so that even at the highest table speed, which is 90 ft. per min., there is no shock and only a moderate peak load.

As previously mentioned, the operating position is shown in Fig. 1. The complete machine control is grouped about the operator. From the same position, he may bring the wheel up or back by hand, feed by hand, throw in and out the automatic wheel feed, and set it by graduation to a quarter thousandth. By depressing a treadle, the direction of carriage travel may be reversed at any time or the shipping dog jumped to bring the table clear of the wheel for unloading and loading. The table speed may be changed at any time by turning a handwheel, or stopped by opening the bypass valve. The flow of coolant is also under complete control as to adjustment of quantity and direction. The hydraulic automatic feed varies from 0.00025 in. as a minimum to 0.010 in. as a maximum, and is positive and adjustable to quarter-thousandths. The amount is indicated on a dial, and one revolution of the pilot wheel equals 0.050 in. of feed.

The No. 74 knife grinder is driven

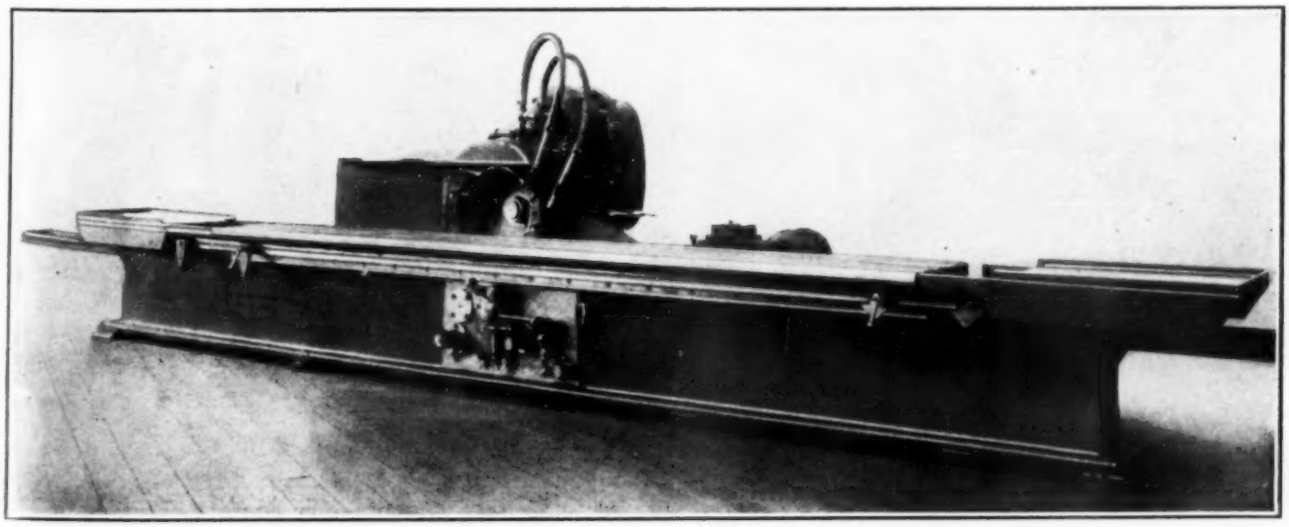


Fig. 1—View of the operating position of the Bridgeport No. 74 Heavy-Duty Knife and Face Grinder

by three electric motors. The main driving motor, either a.c. or d.c., varies in size from 15 to 25 hp., with a suitable speed range from 700 to 1,200 r.p.m. It drives the grinding wheel by means of a silent chain, which is fully inclosed and runs in an oil bath. The carriage driving motor is of 5 hp. running from 700 to 900 r.p.m., and it drives the variable-delivery oil pump through a flexible coupling. The 1-hp. pump motor is direct-coupled to the coolant pump. The main driving motor is shown in Fig. 2 in the upper half.

Adequate arrangements are made for cooling the work. A centrifugal pump with a $1\frac{1}{4}$-in. discharge pipe supplies two 1-in. pipes at the grinding wheel. Two fully adjustable nozzles are provided. The auxiliary flushing hose may be used where necessary. The reservoir carries a large supply of coolant, and is readily cleaned of mud. The coolant arrangements are shown in Fig. 3, at the right-hand side of the illustration.

All table driving gears and the table rack are splash lubricated. The spindle bearings have large reservoirs, which require infrequent replenishing. The grinding-head lead screw is oil immersed, while the main driving chain runs in an oil bath. Where necessary, Zerk high-pressure lubrication is arranged.

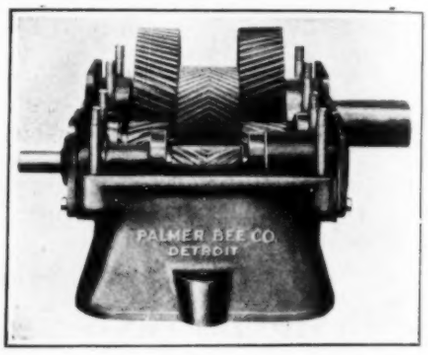
Either an angle bar or a revolving knife bar is furnished with the grinder. A magnetic angle bar, knife bar or chuck may be furnished extra. The length of the revolving knife bar is 2 in. longer than the length of the tab'e, whereas the angle bar of face grinder is 10 in. longer than the length of the table. The maximum permissible height of either is 15 in. The knife bar is strongly proportioned, and is rigidly supported by two end bearings and varying numbers of intermediate bearings as the bar may require. It may be revolved to any desired angle, and knives may be set up to grind either to or from the edge as desired. The angle bar is of such weight and so proportioned that heavy knives may be clamped to it without spring or distortion of the bar.

The grinding wheel consists of twelve sections, and is carried in a strong steel chuck with provision made for moving the segments forward as wear takes place. If so desired, the table may be equipped with a vertical-face magnetic chuck, made in such heights and lengths as required. The maximum concave that can be ground is a $\frac{1}{16}$ in. concave on a 6 in. width at the center of the wheel, with a 10-deg. swing of the wheel. The grinding wheel spindle operates in ball bearings, which have adjustment for slack.

Fourteen sizes of this knife grinder are available, the smallest having a table length of 50 in. and the largest a table length of 216 in. The floor space for the smaller size is 17 ft. 2 in. by 8 ft. 6 in., and for the larger size, 43 ft. 2 in. by 8 ft. 6 in. The weights are 9,910 lb., and 19,080 lb. respectively, while the number of bearings for the knife bar vary from two to five.

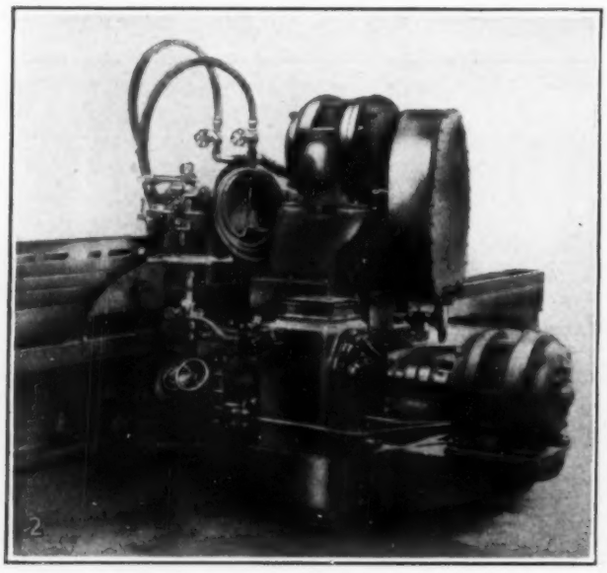
Palmer-Bee Herringbone Speed Reducers

Single, double, and triple series of herringbone speed reducers have been placed on the market by the Palmer-Bee Company, Detroit, Mich. A double-series reducer is illustrated.



Palmer-Bee Double-Series Herringbone Speed Reducer

The single-series reducers have one pair of continuous-tooth herringbone gears, while in the double-and triple-series, the high-speed gears are continuous-tooth, herringbone-type, Sykes-generated gears, and the slow-speed herringbone gears are divided in the center, thus permitting a more symmetrical arrangement of the gear-



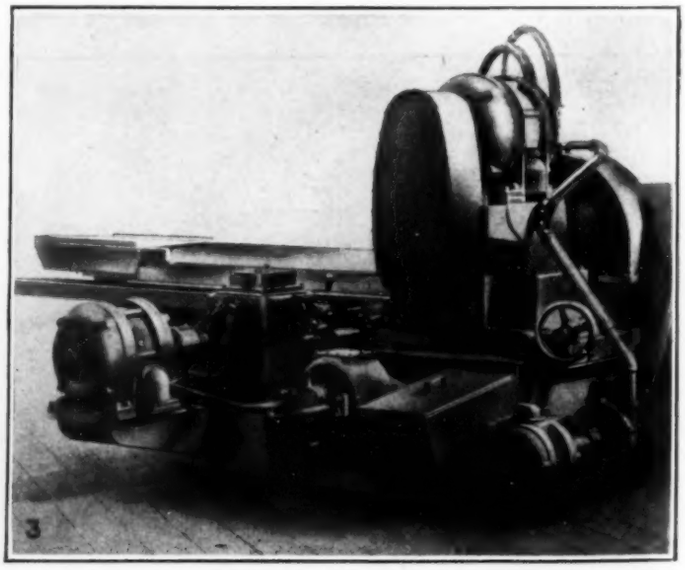


Fig. 2—View of the rear of the knife grinder at the left, showing the main drive motor and the Oilgear apparatus.
Fig. 3—View of the right end of the machine at the rear, showing easily accessible coolant arrangements

ing and an equal distribution of the load on the bearings. All pinions are cut integral with the shafts, and all gears are fitted onto their respective shafts before the teeth are cut. The Sykes generated teeth are cut with the Kysor tooth form.

The shafts are made of S.A.E. 1,045 alloy steel, accurately ground to size. In the single series, Timken tapered roller bearings are used exclusively, whereas in the double- and triple-series ball bearings are used on the high-speed shaft, Hyatt roller bearings on the intermediate, and Timken tapered roller bearings on the low-speed shaft. The bearings are of sufficient size to take care of any stress imposed by overhung loads up to the rated capacity of the reducer.

The housing is constructed of cast iron, strongly ribbed at points where the stress is greatest. It is made in two parts, the adjoining faces of which are planed to form an oiltight and dustproof joint. The lubricant returns automatically to the reservoir at the bottom of the housing after being used. The three series are designed to permit the use of 600-W oil, a heavy-bodied lubricant that retains its viscosity over a long period of time. The efficiency of the single-series reducer, according to the manufacturer, is approximately 99 per cent, and that of the double series is 97 per cent, only a small decrease.

Mil-Waukee-Mil "Broadside" Milling Machines

BY REPLACING the standard face-milling heads with special heads, both the "Simplex" and the "Duplex" Mil-Waukee-Mils have been converted to "Broadside" milling machines by the Kearney & Trecker Corporation, Milwaukee, Wis. In the case of the Duplex model, one head may be standard and the other special, if desired. Power feeds ranging from 3 to 11 ft. may be obtained for either model, and either 14 or 22 in. widths of the table may be specified.

Cutters up to 24 in. can be mounted on the faceplate. The spindle position is fixed in relation to the table, as there is no up and down motion of the table. An internal gear $20\frac{1}{2}$ in. in diam. drives the faceplate. It, in turn, is driven by a pinion to which power is delivered by spiral bevel gears. The ratio of the drive pinion to the internal gear is approximately 8 to 1. A flywheel is mounted on the main drive pinion shaft. Another flywheel, acting as a counterbalance is mounted on a shaft running free. This auxiliary shaft is driven by a pinion from the internal gear of the faceplate. This construction is used to insure a smooth flow of power to the cutter. The auxiliary shaft flywheel prevents the cutter from jumping ahead as each tooth leaves the cut, and the two flywheels maintain a neutral action with one set of forces counterbalancing the other.

The entire head is automatically lubricated, and Timken bearings are used throughout. The main spindle on which is mounted the faceplate is

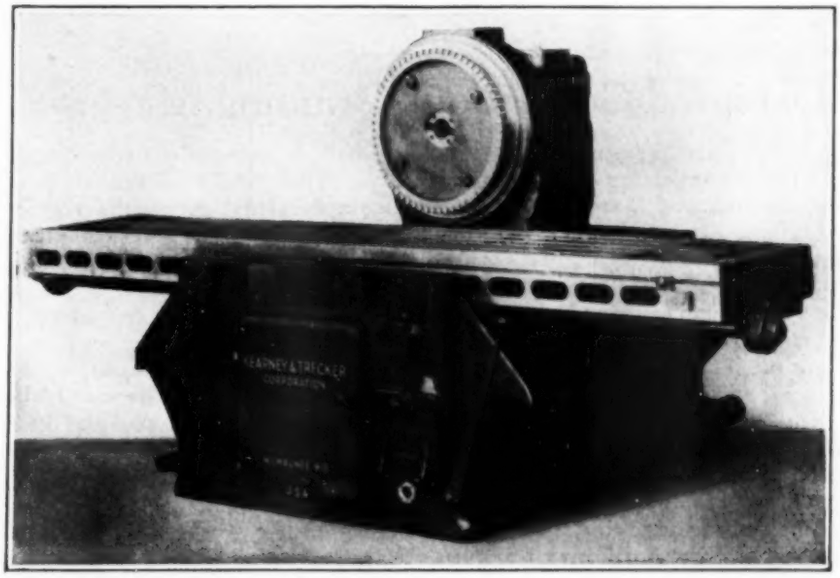


Fig. 1—Front view of the Mil-Waukee-Mil "Broadside" Milling Machine

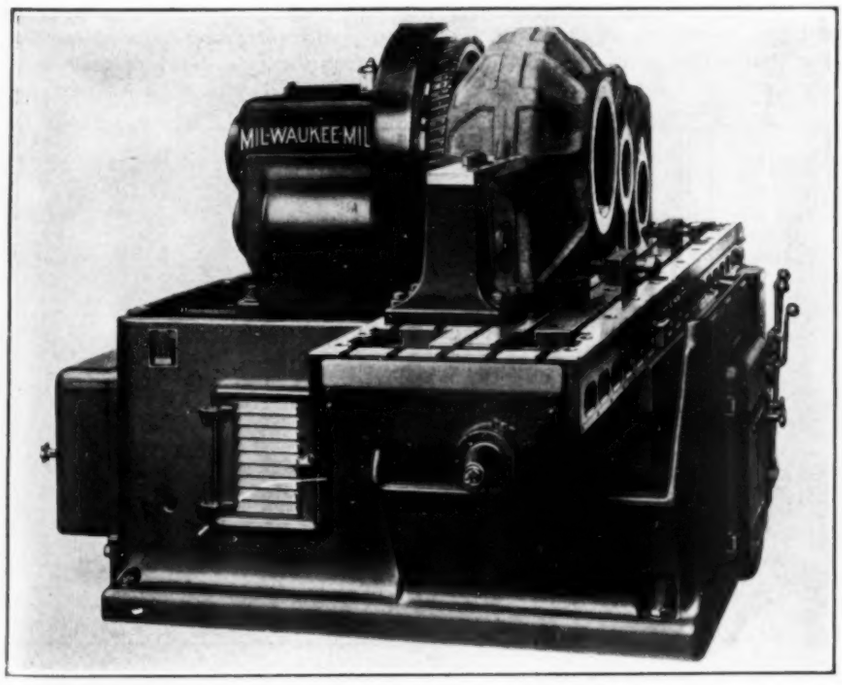


Fig. 2—End view showing the machine in operation

5⅞ in. in diameter, while the outside diameter of the front Timken bearing is 8½ in. and that of the rear bearing 6 inches.

The Broadside head is equipped with pick-off gears, providing twelve spindle speeds ranging from 6 to 51 r.p.m. Quick change gears can not be used with this head. Since the Broadside machine is made up from either a regular Simplex or a Duplex machine, it has the usual eighteen changes of feed, supplied through either pick-off gears or a quick change gear box.

The head is fitted with standardized spindle nose and cutters of the larger diameters are driven by clutch keyways, with the cutters held to the faceplate by means of bolts. The clutch in the standardized spindle will take care of cutters of the smaller diameters.

The Broadside, when made up from the Simplex machine with a single face milling head, or when made up from the Duplex model with two heads, has capacity for a 15-hp. motor, the same as for either the Simplex or Duplex machines.

Diamond Continuous Grinding Machine

APPLYING the principle of continuous operation to face grinding, the Diamond Machine Company, 9 Codding St. Providence, R. I., has designed the continuous grinding machine illustrated in Figs. 1 and 2. This particular machine is for grinding clutch plates, but it will be obvious from the illustrations that it is adaptable for other work.

Up to and including the grinding wheel, the parts are practically the same as those in the standard Diamond face grinding machine. Beyond that point the parts are special, and may be varied for different machines to suit the class of work.

The usual reciprocating table has been omitted and a revolving work-holding fixture substituted. Mounted on this revolving fixture are a number of small air-operated chucks, each of which is rotated by its individual motor. These independently rotating units are carried across the face of the grinding wheel in a vertical plane. The stopping and starting of these small motors is automatic, all being commutated through a central commutator around which they revolve.

The clutch plates are loaded by the operator as the chucks are carried by him. They are then ground and come to a stop, are removed and rough pieces substituted.

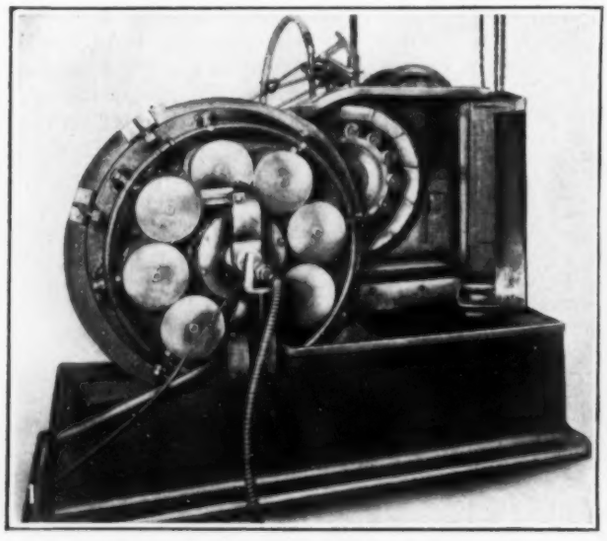
The air chucks grip the rough periphery of the work at three points, the jaws dragging in against a conical surface. They are special and were designed by the builder of the machine. They are made to engage and disengage by means of dogs on the frame that strike pins on the clutch mechanism. The loading position lies between the two dogs, shown in Fig. 1, at the upper left of the work-carrier disk. The work-unit driving motor is cut off and braked before the clutch opening dog is reached.

Two worm and gear speed reducers and a spur gear final reduction are used to bring down the 1,800-r.p.m. speed of the carrier driving motor to the one revolution in 0.7 min. of the carrier. At this speed the output is 5.6 pieces per minute. An endwise adjustment of 8 in. is provided for. Only heat-treated steel shafts are used, the main shaft running on taper roller bearings and the others on ball bearings. Alemite lubrication is supplied.

Magnetic or hand-operated chucks can be used in place of the air-operated chucks and the number and size can be changed. An idea of possible sizes can be best given by comparing it with the standard face grinding machines. These are furnished with 18-, 30-, 36-, 54- and 66-in. wheels.

Taylor-Winfield Special Butt Welder for Mufflers

On the job shown, the heads of the muffler are welded to the body and the intake and outlet tubes are welded to the heads, thus making an entirely electrically-welded muffler. The machine performing these operations is known as the type B-11 special spot welder, and it has been placed on



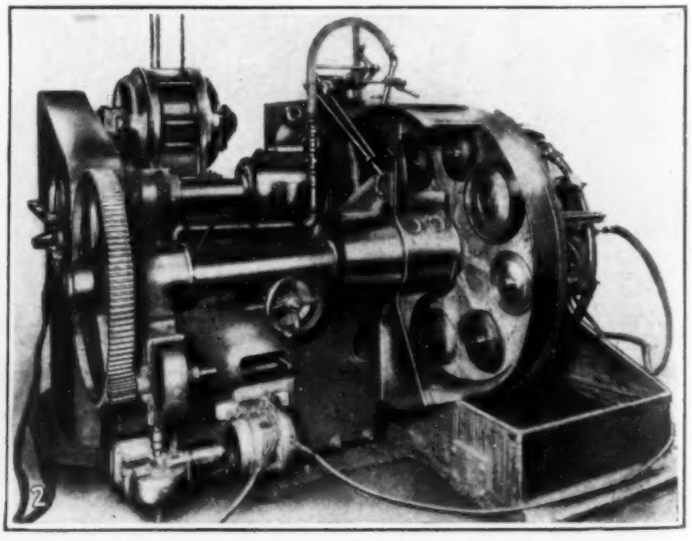
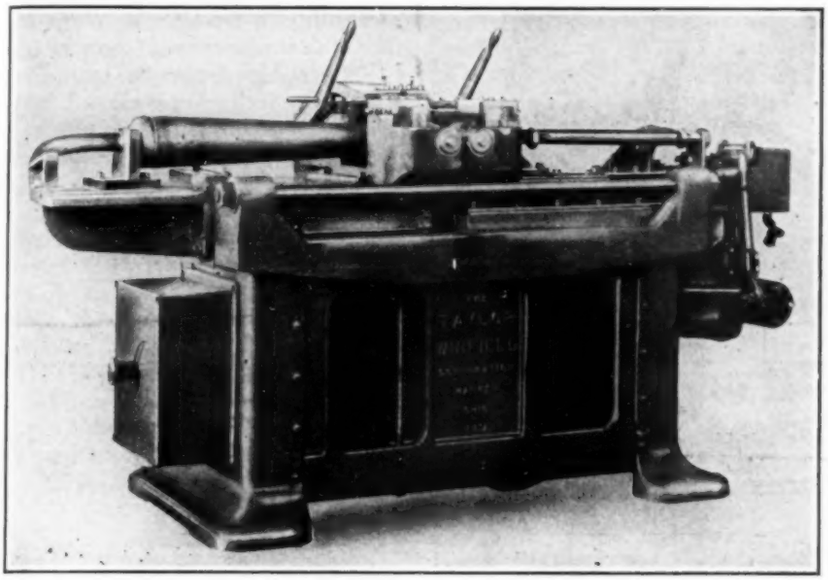


Fig. 1—Diamond Continuous Grinding Machine for clutch plates. Fig. 2—View from the operator's position showing a clutch plate in the chuck at the loading station. The other chucks are not in position



Taylor-Winfield Special Butt Welder for Mufflers

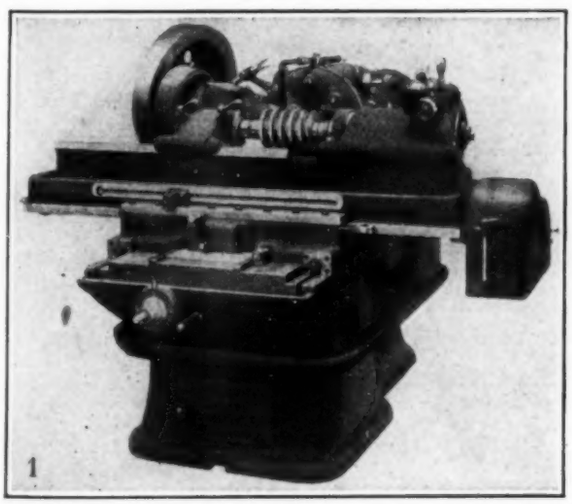
the market by the Taylor-Winfield Corporation, Warren, Ohio. Various gages of stock used in fabricating mufflers may be welded. The timing of the current and upsetting of the weld is accomplished by the use of adjustable cams, which entirely eliminate the human element in the welding operation. According to the manufacturer, the appearance of the weld is uniform, and it is of high accuracy.

Pfauter Nos. S. F. 1 and S. F. 2, Automatic Worm and Thread Milling Machines

TWO models of this worm and thread milling machine, both of identical construction and differing only in size, have been developed by Hermann Pfauter, Chemnitz, Germany. The machines have been placed on the market in the United States by the O. Zernickow Company, 15 Park Row, New York City. The maximum diameter of worm that can be cut on the S. F. 1 is $9\frac{7}{8}$ in., and on the S. F. 2, $11\frac{13}{16}$ in. The maximum circular pitch at one cut by the former is $1\frac{1}{2}$ and by the latter is $2\frac{1}{2}$. Fig. 1 shows the front view of the model S. F. 2, while Fig. 2 shows the same model from the right with the gear cover open.

All components of these worm and thread milling machines are sturdily designed so that the machine will work quietly under the heaviest load. The main parts of the machine, such as the bed, column and table, are strong, reinforced hollow iron castings. The gears, according to load and speed, are steel, bronze or cast iron, and are cut. All shafts are ground at the bearing positions and run in bronze bushings, ring-oiling, roller or ball bearings. The main drive is by single pulley from an overhead countershaft or from an electric motor; the latter can drive either by belt to the single pulley or direct through gearing. The large single pulley or the driving gear runs in roller bearings.

The cutter drive is taken from the main driving shaft through bevel and spur gearing to the cutter spindle. The speed can be changed by putting on different pairs of spur gears. These gears are mounted on tapered studs for ease in removal. Both shafts run in ring-oiling bearings. The cutter head is mounted on a swiveling base on the machine upright, and the tilting of the cutter head is effected by a worm drive built into the upright, a graduated scale being provided to measure the angle of tilt. The cutter spindle is hardened and ground, and is mounted in three bronze bushings. It is adjustable axially, and its main bearing is adjustable radially. By placing the cutter spindle at an inclination of 10 deg. to the axis of the work, large



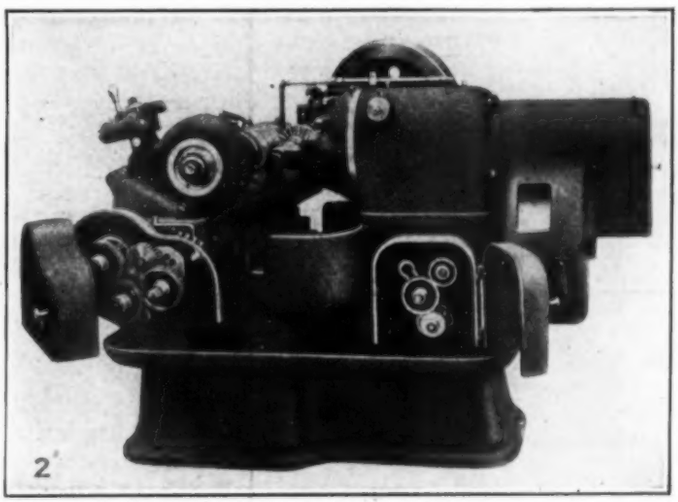


Fig. 1—Front view of the Pfauter S.F.2 Automatic Worm and Thread Milling Machine. Fig. 2—Right-hand view of the Pfauter S.F.2 Milling Machine showing the gear covers removed

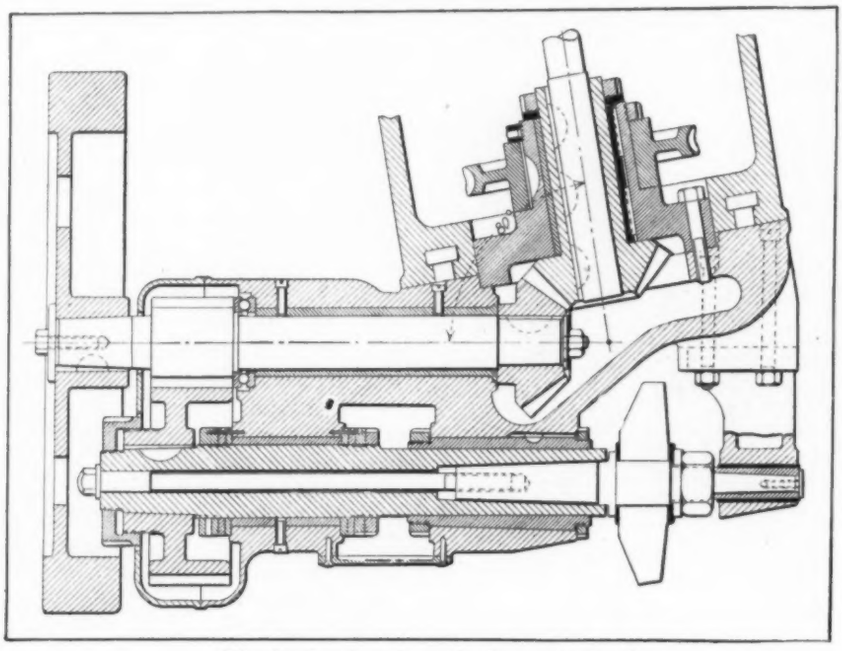


Fig. 3—Section through the cutter head

and powerful driving gears can be employed with a minimum cutter diameter. A heavy flywheel is placed on the intermediate shaft.

The work may be mounted between cutters, on work arbors, in special collets, or in bushings with differential locking nuts. A special index head of large bore takes either the shaft of the work or the work arbor. The index head spindle is adjustable axially. Drive to the index head consists of a wormwheel of high accuracy and a hardened worm, ground all over. It is inclosed in a dust-proof housing and runs in oil. The index drive is governed through lead change gears so that the work revolves in the correct ratio to the longitudinal movement of the work table. In the case of multiple threads, in addition to this automatic movement, there is the indexing from one start to another, effected through a pin-and-plate indexing device on the worm housing, with fine adjustment by worm and wheel. The end of the work opposite to the index head is supported by a tailstock or an outer bearing.

The work table is a wide hollow iron casting, the top surface of which is inclined toward the cutter head, the better to take the cutting pressure. It slides on wide V- and flat ways on the cross-slide, the front of which is adjustable by means of a taper strip. The cross-slide is closely guided in the center by means of a taper strip adjustment. On each side of the cross-slide there is a locking nut. The travel of the table is effected through a lead screw of large diameter, and the axial thrust is taken by ball bearings. The rate of cutting feed is not limited by hard and fast ratios, but the most suitable feed per revolution of the cutter can be chosen for every kind of material and size of cutter and work. The feed drive is carried out by change gears through shafts. It can be disengaged automatically or by hand.

A coolant pump is supplied, having a delivery of about 7 gal. per min. The bed of the machine is designed so as to provide ample splash guards to carry away the coolant and to dispose of the chips. Standard equipment included consists of an index plate with 24 notches, provided for cutting 2- to 20-start worms, a cutter arbor, a clamping device, gage, pick-off driving gears for four or six cutter speeds, and a set of lead and feed change gears.

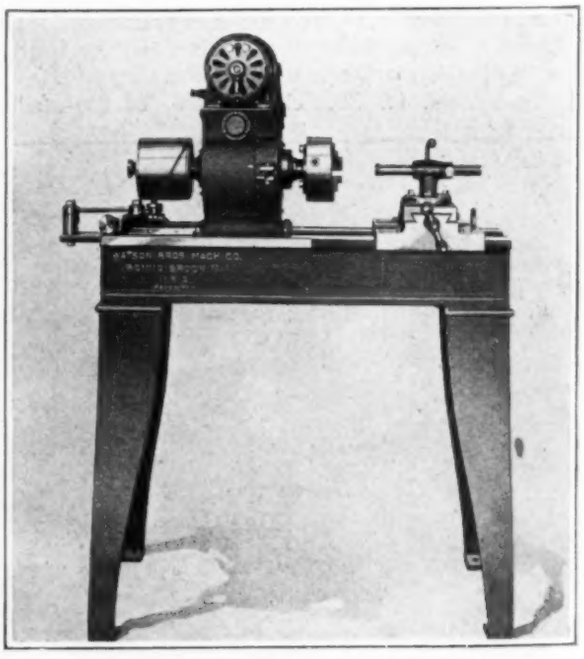
SPECIFICATIONS

	S.F. 1	S.F. 2
Maximum diam. of worms cut, in.	9¼	11 11/16
Minimum root diam. worm, in.	5/16	5/16
Maximum length with smallest and largest worm diam., in.	19½/22	19½/26¼
Maximum pitch at one cut, e.p.	1½	2½
Range of leads to be cut, in.	½–10	½–10
Maximum helix angle for right-hand worm, deg.	90	90
Maximum helix angle for left-hand worms, deg.	18	18
Bore in headstock and through tailstock for worms with shaft, in.	2¼	3½
Bore of cutter, in.	1½	1½, 2
Speed of single pulley, r.p.m.	400	350
Cutter speeds, r.p.m.	30–42–58–81	25–30–39–48–61–76
Weight of the machine, net, lb.	3,860	6,060
Floor space, in.	67x75	71x79
Motor drive: power required, hp.	4	6
Speed of motor, r.p.m.	1,000	1,000

Watson Oil Groover

Bushings up to 6 in. in diam. and 6 in. in length can be grooved on the oil grooving machine, which has been placed on the market by the Watson Brothers Machine Company, Bound Brook, N. J. The machine will also cut barrel cams or score bushings and inserts with endless cross threads for die castings.

A simple adjustment of the stroke arm, depending on the length of the bushing and the setting of the tool, is all that is required to make the machine ready for operation. The spindle is disengaged by a clutch



Watson Oil Groover

when changing work in the chuck, which has a diameter of 6 in. The hollow spindle, having a diameter of $1\frac{1}{16}$ in., is threaded on the end so that an air chuck can be attached. A 6-in. universal three-jaw chuck is standard equipment. The ball bearing groover is driven through a worm and worm-wheel direct-connected to a $\frac{1}{4}$-hp. motor controlled by a switch mounted upon the machine. Three change gears give spindle speeds of 60, 80 and 120 r.p.m. The toolpost may be turned through a considerable angle, and it rests upon a cross-slide. A smaller bench model and a larger size of this oil grooving machine can be supplied. The overall length of the machine is 58 in. The height to the center of the spindle is $41\frac{1}{2}$ in. and the floor space occupied is 20x60 in. The net weight is 500 pounds.

Morton 72-Inch, Traveling-Head, Locomotive-Cylinder, Planing and Boring Machine with Piston-Valve Boring Unit

CONTINUOUS machining operations on locomotive cylinders, such as planing, boring and milling, are possible on this traveling-head, locomotive-cylinder planing and boring machine, which has been developed by the Morton Manufacturing Company, East Broadway and Hoyt St., Muskegon Heights, Mich. The general set-up for these operations is shown in Fig. 1, while Fig. 2 shows the piston valve boring unit separately. The cylinder is first placed on the floor chucks for boring operations. The piston-valve chamber is bored and faced by the piston-valve boring unit, and the main barrel is bored and faced at the same time by the traveling-head unit. When the boring operations are completed, the cylinder is placed in the special cylinder chucks for the planing and milling operations. The traveling-head unit moves over to the work and finishes all the planing and milling. In the meantime, a new cylinder is placed in the floor chucks, and is made ready for boring. When the traveling-head unit has completed the piece, it moves back to the initial boring position for renewing the cycle.

The general construction of this machine is similar to other Morton traveling-head planers. When operating as a planer, it can feed either horizontally on the bed or vertically on the column. It is also provided with automatic feeds for the ram for the operations of boring and milling. The feed gearbox has eight changes in each direction, thus giving a range suitable for both operations. All boring and milling feeds are started and stopped by one lever, and all motions are provided with power rapid traverse.

The floor plate is made in two sections and measures approximately 15 x 20 ft. The cylinder chucks are of the three-jaw universal type, the jaws expanding into the counterbore of the cylinders. The main barrel

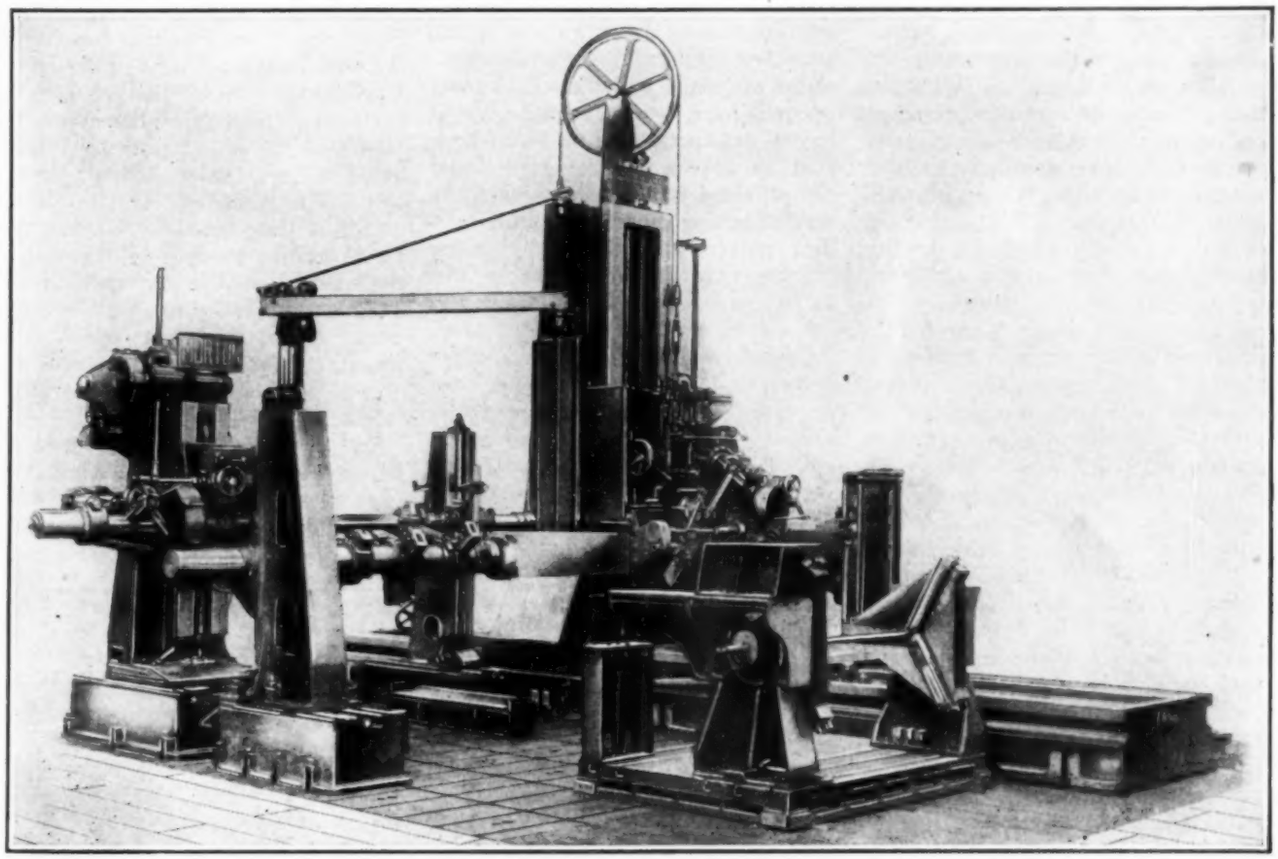


Fig. 1—Morton 72-Inch, Traveling-Head, Locomotive-Cylinder, Planing and Boring Machine with Piston-Valve Boring Unit

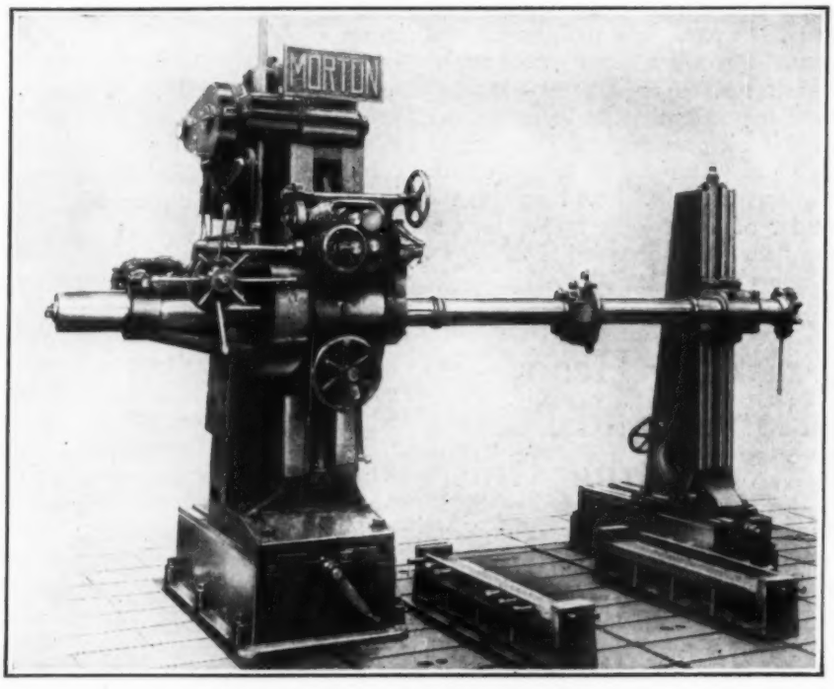


Fig. 2—Morton Piston-Valve Boring Unit

boring unit consists of boring bar, cutter heads and outer support, the boring bar being 5 in. in diam. The port milling attachment may be quickly attached to the square section of the ram without removing the standard planer head. A 10-in. face mill is part of the regular equipment for milling operations, and a one-piece work table is usually included as part of the equipment. It is 30 in. high, 36 in. wide and 8 ft. long. The table is especially useful for holding frames and other large work during the various machining operations. The push and pull-out head is threaded to fit either the planer head or the grip ring. The special extension head is especially designed for planing the upper frame fit of piston-valve cylinders.

The machine has a stroke of 72 in., a vertical feed of 96 in. and a horizontal feed of 18 ft. A longer bed or column can be furnished when desired, giving additional horizontal or vertical feed. Two traveling heads can also be placed on one bed to convert the unit into a double machine. According to the manufacturer, this machine can be used for all kinds of planing, boring and milling. A 10-hp. reversing-type motor is used for operating the machine. Power is transmitted by miter gearing through the vertical shaft to the operating mechanism contained in the vertically moving apron. The reciprocating motion of the ram is controlled entirely by the reversing-motor drive.

The horizontal piston-valve boring machine has an arbor 5 in. in diam., and its vertical and horizontal adjustments are made by hand. The arbor is bored for a No. 7 Morse taper. It has an automatic feed of 14 in. horizontally, and six feed changes. Scales are provided on the columns and the bed for setting the horizontal and vertical movements. A special outer bearing is provided for the boring bar. It has 44 in. of vertical adjustment and 24 in. of horizontal adjustment. Two special parallels are provided for setting and leveling the cylinder for the boring operations. Setscrews are provided for raising and lowering the cylinder as well as moving it sideways.

This unit is driven by a 7½ hp. direct-connected motor, the power being transmitted to the gearbox and friction clutch by a silent chain running in oil.

Blanchard Pulsating System for Oil Lubrication

An automatic circulating system for oil lubrication of machinery has just been announced by the Rivett Lathe & Grinder Corporation, Brighton, Boston, Mass., under the name "Blanchard Pulsating System." The system is designed to operate without attention once it has been properly adjusted.

As shown in the diagram, Fig. 1, oil is circulated from a central tank through a single closed circulating

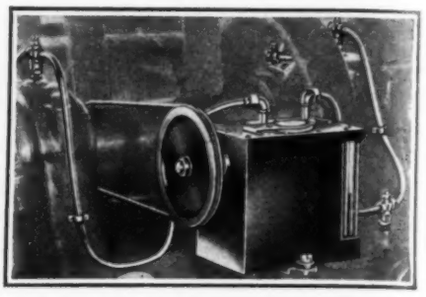


Fig. 2—A typical machine installation

system in which are inserted as many feeders, singly or in gangs, as may be required. The pump, which is contained within the tank and starts and stops with the machine, keeps the oil circulating steadily at a pressure of about 10 lb. for 95 per cent of the cycle. Once every fifteen revolutions of the pump, the pressure control valve located in the reservoir is positively closed and remains closed for the remaining 5 per cent of the cycle. During this interval the pressure in the system builds up momentarily to 50 or 60 lb. and the spring loaded valve in each feeder is lifted off its seat. The amount of lift, and consequently the volume of oil fed, depends on the loading of the spring controlling the feeder mechanism. This loading is adjustable. As the pressure control valve opens, the pressure in the system returns to normal and the feeder needles reseat themselves.

In Fig. 2 is shown the reservoir mounted on the side of a machine. A gage glass is provided, and is protected by a metal guard rod. The filler cap is permanently attached, and

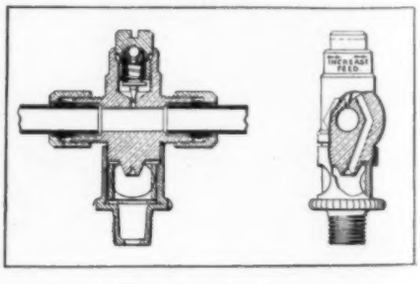


Fig. 3—Cross-sectional views of a feeder

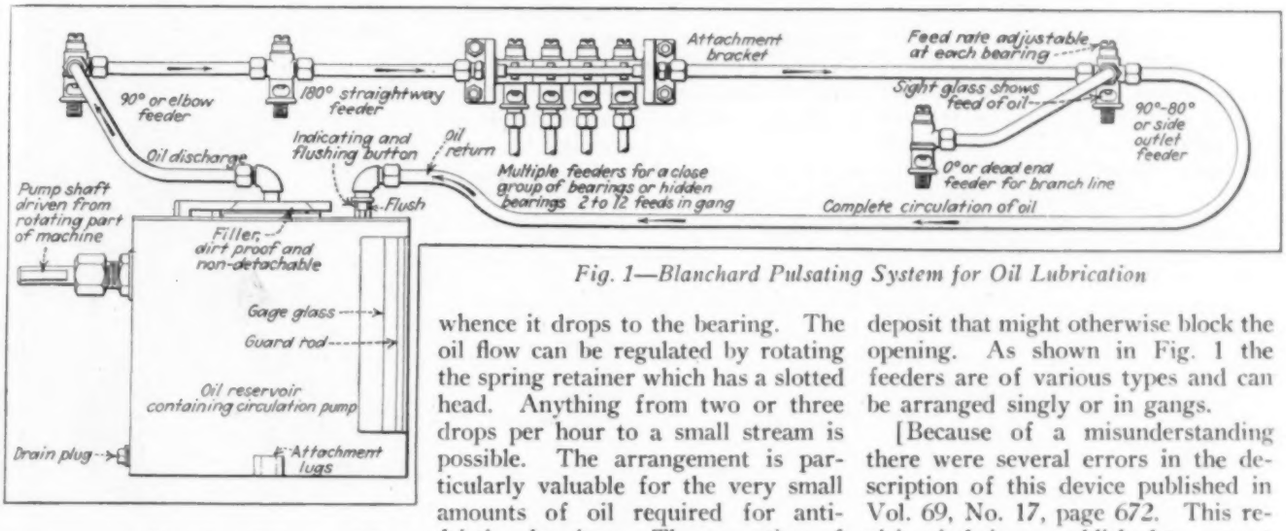

Attachment bracket
Feed rate adjustable at each bearing
90° or elbow feeder
180° straightway feeder
Sight glass shows feed of oil
90°-80° or side outlet feeder
Indicating and flushing button
Oil return
Oil discharge
Multiple feeders for a close group of bearings or hidden bearings 2 to 12 feeds in gang
0° or dead end feeder for branch line
Pump shaft driven from rotating part of machine
Flush
Complete circulation of oil
Filler, dirt proof and non-detachable
Gage glass
Guard rod
Oil reservoir containing circulation pump
Drain plug
Attachment lugs

Fig. 1—Blanchard Pulsating System for Oil Lubrication

is swung aside for filling. When closed, it rests on a curb that prevents dirt from getting into the tank. The opening is screened, and there is a drain plug for emptying the tank, which holds three quarts of any fluid lubricant.

The pump is a simple double-plunger unit with piston valves, and it takes oil through a fine-mesh screen. There are no ball or other check valves in the pump. The shaft can be belted to or otherwise driven from any moving part of the machine, and can be driven in either direction, or reversing. Its speed range is from 75 to 125 r.p.m., and it should require no attention after being installed.

The pressure control valve or relief valve has a button at the upper end of its moving part. So long as the system is operating properly the button jumps with each pulsation, thus providing visual evidence that the system is functioning. Failure to jump indicates a break in the line, a stoppage, or an oil shortage. The button can be held down, thus increasing the spring loading of the relief valve and multiplying the pressure in the system to flush it if the machine has long been idle, or the temperature is low.

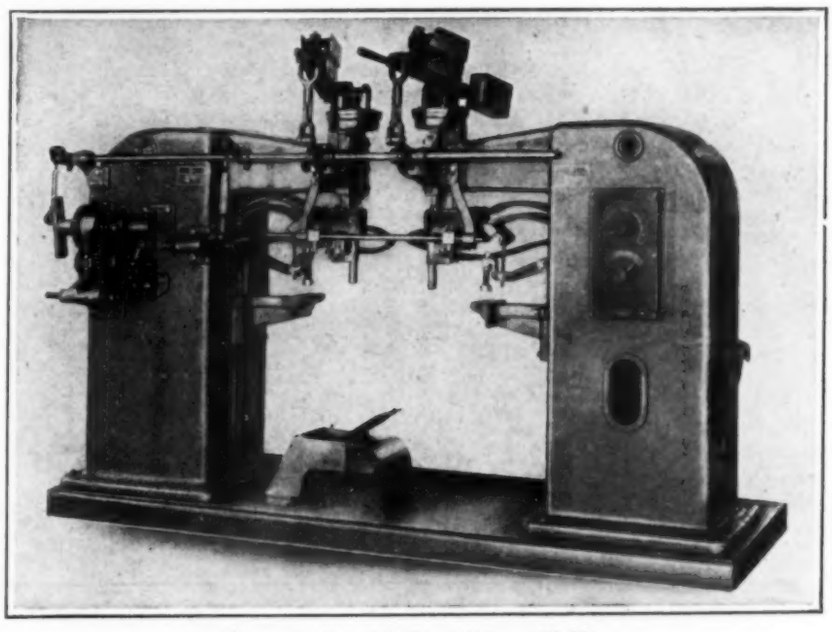
A cross-section of a feeder is shown in Fig. 3. The spring-loaded needle remains seated until the pulsation or increase in the oil pressure reaches the feeder. It is then lifted off its seat and an amount of oil, regulated by the pressure of the spring, passes into the passage above the valve seat and runs down the drilled hole to the sight feed below, whence it drops to the bearing. The oil flow can be regulated by rotating the spring retainer which has a slotted head. Anything from two or three drops per hour to a small stream is possible. The arrangement is particularly valuable for the very small amounts of oil required for anti-friction bearings. The unseating of the valve prevents the formation of a deposit that might otherwise block the opening. As shown in Fig. 1 the feeders are of various types and can be arranged singly or in gangs.

[Because of a misunderstanding there were several errors in the description of this device published in Vol. 69, No. 17, page 672. This revision is being republished to correct any misapprehension.—ED.]

Thomson Special Door-Frame Welder

VERTICAL side members are welded to the top and bottom cross-members of steel door frames by this special welder, which has been developed by the Thomson Electric Welding Company, Lynn, Mass. The door frames vary from approximately 2 to 4 ft. in over-all width, and are made of 22-gage material. The end members are tongued to fit into the side members and are spot welded.

The unit consists of two standard heavy-duty spot welders set up opposing each other and connected so that both heads are operated from one drive. The drive mechanism is shown at the left of the illustration. The equipment was designed to operate at the rate of 100 spot welds per min. The two welders are intended to be mounted on a sub-base having an adjustment for the different widths of doors. A special carriage and work table, mounted on wheels and running on a track, must be supplied by the user. This carriage carries

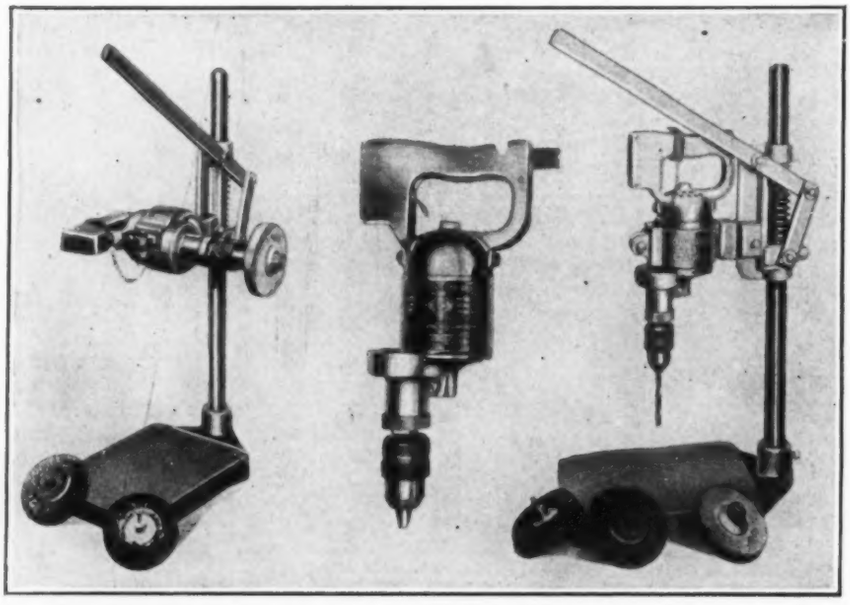


Thomson Special Door-Frame Welder

the door frame, and is tied up with the drive mechanism so that, after one row of spot welds has been made, the entire door frame is moved along for ¾ in., and then another row of three spots is made. The shifting of the upper die points for making this row of three spot welds is done automatically through the special drive unit. A special mandrel is attached to the carriage, and is used inside of the door members. It is supplied by the customer. A special spring-pressure arm is used, and is controlled automatically by the drive mechanism. It is used for clamping the door member firmly against the mandrel to insure locking it in the proper position during the welding operation, and also to insure proper contact between the parts being welded and the current-carrying mandrel. A direct line-break switch is mounted on the welder-head pressure lever, and is controlled through the drive mechanism. The spots produced are spaced ½ in. apart, and the end of a door frame is welded to both of the side members at once.

Wodack ⅜-Inch Portable Drill and Drill Stand

A portable ⅜-in. electric drill weighing about 7½ lb. has been placed on the market by the Wodack Electric Tool Corporation, 4627 West Huron St., Chicago, Ill. Besides drilling, the machine is also suitable for buffing and grinding. It is powered by a General Electric universal motor of the variable-speed type, controlled by a trigger switch. A drill stand so designed that the drill may be held vertically for drilling or horizontally for grinding or buffing can be furnished.



Wodack ⅜-in. portable electric drill shown with adjustable double-purpose drill stand

Ames Amplifying Comparator

Measurements of round, flat and odd-shaped parts can be compared with known standards on the amplifying comparator that has been developed by the B. C. Ames Company, Waltham, Mass. The amplifying scale of the instrument separates readings of ten-thousandths by $\frac{3}{10}$ in., and total variations of plus or minus 0.001 in. are provided for. Work up to 8 in. in diam. may be tested throughout its entire length and all readings may be duplicated. As the instrument can always be adjusted to known standards, it lends itself to production testing, and wear can be compensated for.

To use the instrument, a standard size block or unit is placed on the platen directly under the measuring point, and the dial is adjusted so that the pointer comes to rest at zero. The block is then moved away from the measuring point and then returned a few times to make the adjustment certain. Size variations to 0.000025 in. can be detected.

Ames Amplifying Comparator

The base is of cast iron, and is supported by three rubber feet. A column is bolted to the base against a wide shoulder and carries a bracket, which holds the indicator. The bracket is easily adjusted up and down by means of a rack and pinion, but it cannot drop to injure the indicator when the binding clamp is loose. All adjustments are made by turning large knurled screws. The lever in the bracket is fitted accurately and serves to hold the indicator contact point so as to absorb all strains and forces in the horizontal plane. A stop bracket is provided and consists of a casting and blade of hardened tool steel. Stops on the bracket lever protect the indicator from being jammed or injured.

The platen is of tool steel, hardened, ground and lapped flat, 5 in. long and 4 in. wide. It is mounted on an adjustable spindle of large diameter and fitted with a clamp. It is raised or lowered through the action of a worm and gear by turning a knurled screw on the side. Special shapes and sizes of platens and V-blocks can be supplied. The diamond in the measuring point is rounded and will not mark the work, as the pressure exerted by the point is light. The total height of the device is 16 in. and the weight is 70 pounds.

NEWS OF THE WEEK

Lively S.A.E. Production Meeting Held at Detroit

THE first production meeting of the Society of Automotive Engineers under the recently adopted method of organization was held in Detroit, November 22 and 23, and was well attended. The program arranged by Chairman E. P. Blanchard was well received and stirred up some active discussion.

After an outline of the work of the sub-committee on Processes and Equipment by G. W. Blackinton, John Younger gave a brief outline of the Ford methods of securing low production costs. The principles involved he outlined under fifteen headings among which were: Concentration on a single product; conveyor systems; extreme subdivision of operations; task and definite day rate; sources of raw materials; low inventories with no intermediate profits; quick turnover of capital; simultaneous operations; recognition of obsolescence and depreciation. Enlarging on these principles, he brought out many interesting points, among them that the average training time is 6 hrs. per man, and that capital is turned over fifty times a year.

Under the heading Accounting for Depreciation as a Production Cost, L. A. Baron presented a very interesting paper in language that was clear to the production man who knows little of accounting. Some of the points brought out were that depreciation is not generally understood by management and that it is a real part of production costs, and that depreciation is not confined to machine equipment, but to buildings and patent values. He pointed out that the failure of industry to agree on a uniform method of depreciation accounting had led the Department of Internal Revenue to put its men at work on the subject and that the result of their studies may, or may not, be satisfactory.

The Barnes gear shaver process was explained at length by H. D. Tanner, of the Pratt & Whitney Co., and was well illustrated with slides. Following this A. B. Cox presented his method of gearing known as Integral-Contact Gearing, which has been the subject of several articles in the *American Machinist* beginning in 1925. This method is also known as the elastic-tooth gear in which long teeth deflect sufficiently to distribute the load over several teeth, making for smooth running and quiet gearing, and preventing tooth failure under sudden shock.

The Cylinder Honing Process, by C. G. Williams, reviewed the beginning of the process in 1920 and traced its development, encouraged by a few of the leading builders of automobiles, up to the latest hydraulically operated honing machines. Although wide variations exist among users as to the best rotary and reciprocating speeds, Mr. Williams stated that in his opinion a periphery speed of 200 to 250 ft. per min. and from 50 to 60 strokes per min. gave best results.

Considerable discussion resulted from the introduction of the subject of diamond boring by Mr. Blackinton, revealing a lively interest in the subject and bringing out the fact that it was quite common practice in the final finishing of holes in bronze, babbitt and aluminum, while being used to a limited extent in cast iron. It was also brought out that Widia metal was being used to some extent in replacing the diamond for boring tools and as a cutting edge on drills for high speed boring in steel. This metal, as made in this country, is known as Carboloy and was the subject of an extremely interesting talk by G. H. Sieger at a later meeting.

New Phases of Production

The main address of the Production dinner, which was attended by 760 men, was by K. T. Keller, vice-president of manufacturing at the Dodge plant of the Chrysler organization, who spoke on the fundamentals of the new phases of production, classing them as men, methods and machinery. He felt that processing had progressed farther than assembling and that too little attention had been given to the foremen, who are the men actually responsible.

Material handling was the subject of a very interesting session at which the chairman, V. P. Rumely, presented the committee report which stressed attention to safety and indicated remarkable savings in the handling of sheet steel and other material. N. H. Preble showed the assembly layout at the Oakland plant, much of which has appeared in the *American Machinist*. The Selection of Conveyor Power Units was handled by C. E. Broome who illustrated the different types, and pointed out the advantages of each for various duties. The types included spur, helical, planetary, bevel and worm gear drives.

Possibilities and limitations of conveyor chain curvature were explained by J. B. Webb who specializes on this type of work, the curvature referring to vertical bending of a chain running in a horizontal plane. He pointed out the need of proportioning both the spacing of trolleys and the curvature to the load on the chain and showed by diagrams how the change in vertical planes imposes stress on the links and pins. The use of special chain is not advocated because of the frequent changing of the conveyor requirements in the modern plant. The length of the conveyor chain also affects its operation, the pull frequently amounting to 2,000 lb. in a long conveyor, which occasionally exceeds a mile in length. The friction loss in a properly installed conveyor of this type is given as 3 per cent.

Power Transmission

Power transmission engineering as affecting production and costs was discussed by W. W. Nichols and included many examples of how careful attention to belting had effected marked economies in several plants. Mr. Nichols recommended a suitable storage and maintenance department to include lacing machines, belt cutters and repair equipment, and that all belting should be carefully inspected on receipt by a competent, practical belt man. All belt drives should be under the supervision of a man familiar with shop conditions and tools, and regular reports made on the condition of belts, pulleys and excessive tension. One belt user who had followed the suggestions of Mr. Nichols had reduced belt cost 50 per cent and belt repairs 75 per cent. A. F. Denham gave data from one automobile plant that had reduced belt costs from $1 to 23 cents per car in 3 years, and another plant that had cut belt costs from 28 to 8 cents per motor manufactured. It is noticeable that attention is being paid to economies in other fields than in machining costs.

Under the title of Chain Drives and Their Industrial Application, A. C. Woodbury showed the types of chain drives in use, and presented much information of value to both designers and users.

The last session was very full and well attended. The papers were: Interpretation of Production Records, by Paul Geyser; Relation of Time-Study to Manufacturing, by L. W. Haskell; a report of the Time-Study Sub-Committee, by Eugene Bouton; and a report of the Production Meetings, by Guy Hubbard. In addition G. H. Sieger told about the work with the new tungsten-carbide alloy, Carboloy, and exhibited tools together with samples of porcelain, glass and tungsten cut with these tools. This, as was to be expected, attracted widespread attention and many questions were asked.

French Industry Seeks to Absorb American Initiative

The point of view of Louis Renault is retold

MONSIEUR Louis Renault, than whom there is no better known name in the French automobile industry, on his recent return from America recounted his impressions before the Interallied Club at Paris. He was impressed chiefly by American initiative which concentrated and intensified the economic life of the country. Public opinion, he said, took the livest interest in economic and industrial problems which in France were the concern of only those who were directly engaged therein. The result was that effort was encouraged to proceed along lines which were already accepted by the public as for the general good of the whole people. In an industrial sense this meant maximum production in a minimum of time.

He observed that the contrast which exists in France as compared with conditions in America was that the mass of French industrialists were ignoring the scientific and idealistic factors which were fast bringing an unbelievable prosperity to all classes in the United States.

He pointed out the danger for old Europe, and for France in particular, in that they would not, rather than could not, get the same labor effort from workers here. He believed that even a greater danger existed in Europe in that manufactured goods, where hand labor played so large a part in their production, were bound to be a more costly product than similar American goods. As a result of this, European countries were buying foreign-made goods (largely American) in place of the home product and a tendency was already observed that the consuming public was urging its governments to lower tariff rates in order that they might further benefit as consumers.

Protection, however, as he said, is more than ever desirable as a tenet of Europe's economic creed. In France, above all, by reason of the formidable charges which the war has laid upon the government, this was really a revenue measure more particularly than it was a protection measure. He suggested that this was in spite of a willingness to accept this conclusion in that it was admitted that French industry—again as a result of the war—was already behind in production methods as compared with those of America.

He urged the government to adopt measures which would virtually compel national industries to take heed and bring into their organizations equipment and methods that would result in turning out a maximum volume of product with a minimum of time and hand labor.

Monsieur Renault admitted that it was not an easy task to inculcate new methods of work in a generation of workers whose habits were already formed. It would be necessary that a campaign of education be undertaken and that this education should begin with primary and secondary schools. A difficulty that he foresaw was that those of the teaching profession in France were themselves not equipped to give even the vaguest notions of national economic questions to their pupils.

He suggested that some arrangement should be made whereby a number of young teachers should be sent to the United States each year to absorb in some measure "the spirit of modern progress as evinced by the American mentality" to the end that they might be equipped to pass this on to their pupils in France. The procedure however should be that these returning teachers or professors should themselves be appointed to the French normal, or teachers' schools. It would not be long, he says, before these professors would demand that the government should ordain special courses in the primary, superior and technical schools that should tend to place the youth of a coming generation on a far different footing from those of today.

Monsieur Renault argued that it would not be desirable to scatter such visiting students, but that they should be placed exclusively in the principal production centers, such as Boston, Philadelphia, Pittsburgh, Detroit and Chicago. He believed that the French government and the various Chambers of Commerce and Trade Associations in France could well be got together on the matter of finance and procedure and that in each of these cities, and perhaps in others, a *Maison de France* should be established on the lines of the University City in Paris, where the United States has a special *locale* for students of American nationality.

The subject so interested those present on the occasion of Monsieur Renault's discourse that Monsieur Doumer, president of the French senate and Monsieur Henry Paté, president of the chamber of deputies, declared that the government would certainly not make any opposition to the consummation of some such plan.

Since his first address, Monsieur Renault has developed his plan before various employers' associations each and all of which are understood to have been in accord with his presentation of the project which is doubtless destined to become a reality before long.

Editors Address Oakite Staff

During the annual sales conference of the staff of Oakite Products, Inc., held in New York, November 14-17, editors from several publications addressed the gathering. W. E. Irish, associate editor of *American Machinist*, gave an address on cleaning operations in the machine tool and accessory field, and P. W. Swain, managing editor of *Power*, spoke of the need for further development of cleaning methods in the power plant field. W. Drew, Eastern representative of *Bus Transportation*, also spoke, stressing the importance of cleaning operations in servicing bus fleets. One of the interesting phases of the convention was the demonstration of paint stripping on the side of a full-size locomotive tender with apparatus made by Oakite engineers. In all nineteen papers were presented on technical, sales and service topics.

Diversfied Exhibitors at Power Show

As in previous shows, the seventh national exhibition of Power and Mechanical Engineering, to be held at the Grand Central Palace, New York, N. Y., December 3 to 8, will be featured by a wide diversity of products. A partial list of firms of interest to readers of the *American Machinist* appears below.

Alexander Brothers, Inc.
Allen-Bradley Co.
American Mond Nickel Co.
American Pulley Co.
American Society of Mechanical Engineers.
Atlantic Gear Works.
Ballard Tool & Specialty Co.
Barrett Machine Co.
Bearium Bearing, Inc.
Bearings Industry, Inc.
Boston Gear Works Sales Co.
Botfield Refractories Co.
Brown Instrument Co.
Builders Iron Foundry
Campbell, Andrew C., Inc.
Carborundum Co., The.
Carr Fastener Co.
Century Electric Co.
Cincinnati Electric Tool Co.
Cleveland Worm & Gear Co.
Clipper Belt Lacer Co.
Compressed Spruce Products Co., Inc.
Cooper-Hewitt Electric Co.
Detroit Lubricator Co.
De Walt Products N. Y., Inc.
Dixon, Joseph, Crucible Co.
Doehler Die Casting Co.
Electric Controller & Mfg. Co.
Electro-Magnetic Tool Co.
Fafnir Bearing Co.
Falk Corporation
Fawcus Machine Co.
Gallmeyer & Livingston Co.
Ganschow, Wm., Co.
Gears & Forgings, Inc.
General Electric Co.
Hisey-Wolf Machine Co.
Houghton, E. F., & Co.
Howell Electric Motors Co.
Ideal Lubricator Co.
Industrial Engineering
International Nickel Co.
Jones, W. A., Foundry & Machine Co.
Keller Mechanical Engineering Corporation
Keystone Lubricating Co.
Landis Machine Co.
Leeds & Northrup Co.
Lincoln Electric Co.
Linde Air Products Co.
McGraw-Shaw Co.
Mall Tool Co.
Midwest Air Filters, Inc.
Milburn, Alex., Co.
Morse Chain Co.
Motor Tool Specialty Co.
Norton Co.
Oakite Products, Inc.
Ohio Forge Co.
Okonite Co., The
Olsen, Tinius, Testing Machine Co.
Oxweld Acetylene Co.
Palmer-Bee Co.
Pels, Henry, & Co., Inc.
Philadelphia Gear Works.
Porter-Cable Machine Co.
Production Machine Co.
Pyrometer Instrument Co.
Rivett Lathe & Grinder Corp.
Ryerson, Jos. T. & Son, Inc.
Scherr, Geo. & Co.
Schuchardt & Schutte.
Shafer Bearing Corporation

Shepard Electric Crane & Hoist Co.
Silent Hoist Winch & Crane Co.
Simonds Saw & Steel Co.
Skilsaw, Inc.
Sprucolite Corporation
Square D Co.
Staynew Filter Corporation
Taylor Instrument Companies
Taylor-Winfield Corporation
Thermal Units Co.
Timken Roller Bearing Co.
Torchweld Equipment Co.
Unishear Co., Inc.
United States Electrical Tool Co.
Van Dorn & Dutton Co.
Van Dorn Electrical Tool Co.
Veeder-Root, Incorporated
Wappat Gear Works
Weston Electrical Instrument Corporation.
White, S. S., Dental Mfg. Co.
Whitney Metal Tool Co.
Woodworking Machinery Co.
Yale & Towne Mfg. Co.
Zobell Electric Motor Corporation

McGraw-Hill to Have Chicago Building

Signalizing the rapid development of its publishing operations, the McGraw-Hill Publishing Co. is having erected for it in Chicago a building to bear its name and for the first time is placing there a resident vice-president as head of its Chicago interests. The building is now in course of erection at 520 North Michigan Ave., two blocks north of the Wrigley Building in a rapidly developing new business center, and will house all the McGraw-Hill interests centering in Chicago. The resident vice-president will be Edward J. Mehren, editor of *The Magazine of Business,* who has been with the McGraw-Hill organization in New York for 22 years in editorial and publishing capacities.

These two moves are a logical result of the rapid expansion of the company's activities in Chicago. It now publishes there four papers, *The Magazine of Business, Factory and Industrial Management, System,* and *Harvard Business Review,* the latter published for the Harvard University School of Business Administration. A fifth magazine, *Industrial Engineering,* will shortly be transferred from New York to Chicago.

Management Sessions in New York

The annual meeting of the Taylor Society will be held in Rumford Hall, 50 E. 41st St., New York, N. Y., on December 5 to 7. On Wednesday, December 6, G. E. Schultz, Armstrong Cork Co., will deliver the paper: "Variations in the Application of Engineering Technique to Management." On Thursday afternoon, there will be a paper on basic principles of cost accounting, by J. H. Williams, industrial engineer, and in the evening Morris L. Cooke, president of the Taylor Society, will deliver an address entitled: "Some Observations on Workers Organizations." Geoffrey Brown, consulting engineer, will present the paper: "How Scientific Management Can Promote a New Functional Status for Workers."

On Friday, E. Hayden Hull, consulting personnel engineer, will speak on the technique of selection for sub-executive positions. In the afternoon, there will be several inspection trips, one of them to the plant of the Sperry Gyroscope Co. in Brooklyn. Other papers to be presented touch on broad subjects of management.

Aeronautical Notes

The Aeronautical Corporation of America, which was recently organized by business men of Cincinnati, will start production of the Dietz airplane in the near future. The corporation also intends to build engines and equipment, and has acquired the manufacturing rights and designs from the Dietz Experimental Laboratories of Dayton, Ohio. Conrad Dietz is general manager. John Roche, formerly in the U. S. Air Service at Dayton, will be production engineer, and George Galloway, who has been with the Packard Motor Car Co. and the Curtiss Co., will be on the staff.

Construction has begun on the airplane factory of Parks Aircraft, Inc., St. Louis, Mo. The main building is to be 100x580 ft. and will cost about $150,000.

The Fairchild Airplane Manufacturing Corporation, Farmingdale, L. I., has purchased the minority stock interest held by Harold and Leon Caminez in the Fairchild-Caminez Engine Corporation, and will consolidate the engine and airplane activities. Harold Caminez and David Caminez have resigned as chief engineer and treasurer, respectively, of the engine corporation.

The Butler Manufacturing Co., Kansas City, Mo., maker of steel products, has announced the formation of the Butler Aircraft Corporation to act as a selling organization for planes manufactured by the parent company. A large section of the Kansas City plant has been set aside for the manufacturing division.

Tests of aircraft welded joints are being carried on at the Bureau of Standards to provide data as to safety for licensing purposes and to determine the optimum design. Results based mainly on 1½-in. mild carbon steel tubing indicate that the present joints will fail in a compressive member before the full tensile strength of the joint is developed. Further studies will be made to work out the proper nature and dimensions of the reinforcement and the best angle of convergence which will distribute stresses equally through the members. From now on, it is intended to use chrome-molybdenum steel which is generally accepted as replacing mild carbon steel in aircraft work.

League Survey Shows Germany Leading in Engineering Development

A SURVEY made by the consultative committee of the economic organization of the League of Nations shows that development in both mechanical and electrical engineering has been greatest in Germany, due largely to the recovery of her domestic demand after the depression in 1926. The report is fragmentary, but it does cover the principal European producing centers, and it gives an indication of what may be looked for in the matter of world market competition if the present pace continues.

From 1926 to 1927 domestic sales of machinery in Germany increased 47 per cent and export sales by 14 per cent. Electrical engineering industries are believed to have increased production to a lesser degree though the depression of 1926 was perhaps more pronounced and it has taken longer for the home demand to catch up with its normal speed of progress.

Great Britain's industrial unheaval of 1926 caused the mechanical engineering industries to suffer a setback variously estimated at 10 to 15 per cent as compared with 1925, as well with respect to general output, export sales and numbers employed. In 1927, due somewhat to the absence of any industrial disputes, the 1925 position was fully regained.

The value of Switzerland's machinery output in 1927 is estimated at 330,000,000 francs, but it is believed that with a slowing down in domestic electrification plans, due to the completion of many projects which had previously been carried out intensively, a falling off is looked for in the home market while as to export the keen competition which Switzerland has to meet in world markets is still further handicapped by an utter absence of raw materials,

Conditions in both France and Italy were greatly affected by readjustments and variations in the relative values of foreign exchanges. Much time was lost in France owing to the retarding of the stabilizing of the franc thus discouraging industry from adding to equipment and the consumer from buying output once it got on the market. Even French automobile exports which had been piling up foreign credits to the benefit of French makers felt the effects with respect to both its foreign and home trade. The smaller industries were better off than those of larger capitalization due it is believed to the favorable terms on which short term money could be secured.

The electro-mechanical industries in France have a capacity output of at least 1.8, perhaps 2, times that of output as shown by the results of 1927 which were inferior to that of 1926. The turnover in the year 1926 is estimated at about 4 billion francs.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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PERHAPS it is not so elsewhere, but in New York the wild speculation on the Stock Exchange obscures most other forms of commercial or financial activity. The newspapers are filled with stories of the stock market, and but little else is talked of at the clubs, the hotels and other places where men and women meet; for men no longer have a monopoly of stock speculation.

Trading on the Stock Exchange, as well as on the Curb and in the over-the-counter market, has reached unprecedented proportions. Of course, someone must be selling, but everybody seems to be buying, and when the buyers are asked why, they generally answer that some friend has told them that the security or securities in which they have put their money are going up. The danger of the situation is generally appreciated by those who usually shape financial opinion, but their counsels of caution are disregarded, and the buying goes merrily on.

At a governors' convention held in New Orleans, Governor Brewster of Maine announced and advocated the adoption of Mr. Hoover's plan for "stabilizing prosperity." Briefly, it contemplates that the states and the national government shall appropriate a total of three billion dollars to be expended for public work and improvements whenever a depression in industry or business threatens to create unemployment and hard times. The plan is plausible, and has a strong appeal for the speculative imagination.

It has been accepted as a sort of moral guarantee that the Hoover boom would last throughout the Hoover administration, and there are many who are acting upon this theory in buying the securities that are dealt in on the 33 stock markets of the United States and Canada. It remains to be seen whether the plan will be workable or not, but it has added fuel to the flames, and as money is slightly easier upon a continuance of gold imports, there is nothing in sight to check the upward movement for the present.

The report of the Federal Reserve Bank of New York, issued on Thursday evening, shows that brokers' loans increased $176,300,000 during the week, but the increase attracted little attention, and has had no effect upon public sentiment. Of course, the end must come some time, and the fear that it may be nearer than the enthusiastic are willing to admit is making sober merchants careful. But business is good, and carloadings for the week ending November 10 showed an increase of nearly 7 per cent upon last year's figures.

Railroad earnings for October also promise to be large, and all the statistics available indicate an expanding trade. The Christmas business promises to be enormous, and a feeling of cheerfulness is reported in nearly every line.

WHAT'S DOING IN INDUSTRY

FROM all reports, sales of machine tools this month should equal, if not exceed, those of the previous one, which was a record, according to the index of orders of the National Machine Tool Builders Association. In all centers reporting but one, the trade has been on the upgrade, and as stated last week, the results of the election has stimulated buying, which was by no means slack up to election day. The exception is the South, where trade in machine tools is rather quiet, but the outlook at least is promising. One bright spot, however, is activity in the textile machinery field, due to the building of mills in this section.

POST-ELECTION buying features the New England market, and here also textile machinery builders are active. A pick-up in general metal-working activity is also reported, as it is in the New York territory. There purchase of $500,000 worth of equipment by the Wright Aeronautical Corporation featured the buying this week. Many buyers, formerly hesitant, have now entered the market in Indianapolis, and early winter business has opened up actively, buying by the rejuvenated coal mines being the feature.

CHICAGO finds November the best month in many years for tool builders, but railroad buying, of which this city is the center, is rather limited, as it is in other parts of the country. In Detroit, while automotive production has been curtailed, the usual severe holiday slump is not anticipated, and many model changes are forcing the purchase of needed equipment.

UNUSUAL heavy demand for railroad rolling stock features the Canadian market, and is keeping the steel mills busy.

The cheerfulness of the steel industry continues, and despite Henry Ford's announcement that he would make two million cars in 1929, the other automobile companies seem to be planning a continued increase in their production.

But this roseate picture of the situation would not be complete if it failed to include a reference to the general expectation that the Congress which meets next week will enact some substantial measure of farm relief, and that President Coolidge will approve of it. Failing such action it would seem impossible for Mr. Hoover to avoid calling a special session of the new Congress as soon as he is inaugurated, and as business is never very happy while Congress is in session, it may be that March 4, 1929, will prove to be an epochal date in more senses than one.

In the foreign news there is not very much that has any direct bearing upon the business outlook in this country. In England there seems to be a continuance of the economic improvement previously reported. The same thing is true of France, and Germany appears to be prosperous despite the taxes made necessary by the reparations for which she is liable, and is trying to fund in a great national loan, for most of which America is expected to subscribe.

The meagre news that comes from Russia seems to indicate great unrest there and some correspondents intimate that a revolution is brewing. Of the facts no one can be sure. Much unrest in Italy is also reported privately, but the Italian censors have thus far been successful in suppressing any publication of the rumors that are being circulated.

In the Orient a distinct improvement seems to be in progress, and those who are in close touch with China insist that the Nanking Government is making wonderful progress in the work of political reconstruction and commercial rehabilitation. Certainly the demand for American merchandise from China shows a marked improvement.

The outlook in the East has also improved, and as China, Japan and India contain nearly one-half of the world's population, an expansion of trade in those countries means a substantial increase in the demand which Europe and America is prepared to supply.

Taking the situation in its entirety, the economic outlook, ten years after the war's ending, is remarkably encouraging.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, incidate the trend of business in these industries and what may be expected from the future:

DETROIT

The machinery market here has maintained a more or less even level during the past few weeks although there is a slight decline noticeable in some fields. The automobile output has been materially curtailed but it is still very high and there are still many plants in the market for equipment of all types.

The big event of the week of course has been the announcement of the new Chevrolet six-cylinder line. The company has been preparing for this change for nearly a year and a great deal of machinery and equipment has been purchased. It is extremely likely that a great deal more will be needed when the car is put into heavy production.

Ford is still buying some machinery and is still giving a great deal of work to the small shops. The body builders are busy as are also most of the accessory makers. Oakland is going ahead rapidly; the Hayes Body plant in Ionia is planning a large expansion program, and the Briggs body plant has taken over the old Highland Park Ford plant and will probably get into production soon.

Deliveries in some lines have caught up a little, but some of the dealers handling standardized equipment report that they are still five and six months behind their orders.

The general condition of business here is excellent, and there is a feeling that the automotive industry will not take as great a holiday slump this year as it normally does.

NEW ENGLAND

All indecision by industrial concerns, due to election uncertainties, has now been dispelled. Buyers who postponed purchases until the situation had satisfactorily adjusted itself have in no small measure been responsible for the very encouraging November orders. The past week further exemplified this condition.

Industrial conditions throughout New England now show exceptional signs of improvement within those industries regarded as weak links. Textile centers report a more satisfactory volume of machinery purchases and prospects than at any time this year. The Borden Co., Fall River, Mass., is in the midst of a machinery buying program. The Fisk Co., New Bedford, is to spend $300,000 for tire fabric machinery. At Manchester, N. H., the Amoskeag Company has 11,000 names on the payroll, more than at any time since 1922. A spurt of extended duration on the part of this industry would benefit machine tool builders. Depreciation in mill machine shops has been allowed to go on unheeded. Replacements and extensive retooling have in many instances become a sad necessity.

CHICAGO

November has kept pace with the four months immediately preceding it in the matter of business transacted in machine tools. District representatives of some of the tool building plants located in the Midwest territory agree with practical unanimity that not in several years has there been so great a demand for their products in any one month. Their chief difficulty has been to meet this demand by deliveries within a reasonable time limit. This condition applies especially to milling and screw machines, the call for which has kept the plants working at high pressure. In other lines no indication appears that there has been any let up in the volume of trade, the general trend of the market being upward.

Railroad buying is limited to small lots, and, so far as can be ascertained, there will be no distribution of any material lists until the budgets for 1929 are made up, which probably will not be until some time in January. The International Harvester Co. and the J. I. Case Threshing Machine Co. still are buying against lists in the hands of the trade. Business in used tools continues good, with inquries increasing and prices well maintained.

CINCINNATI

Reports of machine tool manufacturers in the Cincinnati district are decidedly optimistic, it being stated that business showed a further improvement in the past week and the market trend still is upward. The fear expressed a few weeks ago that there might be a falling off of orders as the year approached its end has disappeared, and now the opposite view prevails in the trade.

"Business is holding up well, and everything seems to point to favorable conditions the remainder of the year," said one manufacturer. "We are now having a good volume of sales and it seems that the year will finish well," said a second. "Prospects look better every day; sales are at a good level, and there is no indication of a falling off of business as the year nears its end," said a third. "Business has been picking up ever since the election, and there is no indication that the volume will decrease," said a fourth.

Manufacturers of large tools, who gage their business by the month, rather than by the week, report that the market trend has been upward the past month. "Business is at a good level now, and I see no indication of a decreased volume in the near future," said one. "The business trend is upward, and in my opinion there will be no recession as the year advances, but on the other hand I look for a still better demand," said another.

The sustaining feature of the week's market was the sale of single tools, the great majority of the orders coming from miscellaneous users, well scattered geographically.

A good volume of well diversified and well scattered inquiries were received in the week, the major portion of these coming from miscellaneous users.

CANADA

Many factors are contributing to the high level of business being maintained by the machinery and machine tool industry in Canada, but outstanding is the unusually heavy demand for railway equipment. The combined equipment orders of the Canadian Pacific and the Canadian National Railways to date comprise ovee 4,000 cars, the business being distributed among several companies.

The steel companies are reflecting the railway orders through the increasing demands upon them by the foundry companies. The Algoma Steel Corporation reports that the Canadian Car Co. is buying heavily from them, while the Eastern Car Co. is making its purchases from Besco. The Sydney steel mills are reported to be booked with rail orders to keep them operating at a very fair rate until early next summer.

Harvest machinery is in strong demand at present and a heavy business is being done in spot cash sales. The successful harvest of 1928 has permitted the farmers to buy much more freely than ever before, and agricultural machinery manufacturers have increased production considerably.

Judging by interim reports the year 1928 will likely prove to be the largest in production of motor cars that Canada has ever experienced. The outlook for the automotive industry next year is encouraging, with prospects for good demand in view of the prosperous conditions prevailing. In addition, most of the automobile companies are introducing new models, which stimulate demand.

INDIANAPOLIS

Early winter business in the machinery and machine tool trade here has opened up actively. Most users are in the market for their requirements and one of the encouraging features of the trade is the fact that many buyers who have been rather slow during the summer, have entered the market in a much more active position. It is doubtful if for two years the position of the trade has been as satisfactory as at the present time.

Buying continues particularly good in the automobile field, particularly the accessories field, where most of the plants are working at capacity. Plants like Remy at Anderson and Muncie, like the Perfect Circle Co. in Hagerstown, Tipton and Newcastle, and the Noblitt-Sparks Corporation, of Indianapolis and Columbus, are heavy buyers of smaller machinery and tools. Their employment figures continue to grow.

The settlement of the coal strike has opened up that field in good shape. Following an idleness of seventeen months, the mines were pretty badly out of repair and a considerable volume of new machinery and tools had to be bought. This was particularly applicable to small tools for the blacksmith and machine shops. Most of these tools, unless carefully guarded, had been misplaced or put out of commission through disuse. The mine operators have been buying rapidly for a month in order to get their mines into operation as quickly as possible.

Demand from the railroads is average. Demand from the woodworking plants, particularly radio cabinet builders and others of like nature, has been very good for special machinery.

NEW YORK

Purchases of machine tools, to the extent of about $500,000, by the Wright Aeronautical Corporation, Paterson, N. J., overshadowed any other business that transpired in the Metropolitan district in the past week. Among the machines involved in this wholesale purchase of equipment were: five Norton cylindrical grinders, Cincinnati centerless grinders, nine Warner & Swasey turret lathes, 26 Gisholt turret lathes, LeBlond crankshaft lathes, Carleton and American radial drills, Barnes all-gear drills, fourteen Mil-Waukee-Mils, Cincinnati milling machines, Bullard Multi-Matics, Acme, Gridley and Fay automatics, sensitive drills and other equipment. These

sales will, of course, boost the sales volume of many dealers and factory representatives this month, but with few exceptions a good volume of orders coming from miscellaneous sources is being maintained.

The next purchaser of importance looked to is R. Hoe & Co., which recently purchased six planers, and which is said to have bought a number of milling machines in the past week. Some time ago this firm inquired for prices on engine lathes, and blueprints are now out for turret lathe applications. Cylindrical grinders are also being considered.

At least two dealers predict that the month will be the best this year as far as machine tool sales go, one of them stating that the month's business would be two and one-half times normal. Sales of grinding wheels made by the Norton Co. during the month of October surpassed all records, both for the company as a whole and for the New York territory. One of the largest purchasers being an anti-friction bearing manufacturer. Such sales are a fair index of metal-working activity. In fact, every indication is that there is more shop activity now than at any time this year.

Sales reported by the Pratt & Whitney Co. during the week included: one deep-hole drill, a 14-in. vertical surface grinder, a 6- and a 10-in. thread miller, two No. 2 jig borers, a 6-in. vertical shaper, a 13-in. lathe, and a single-spindle Sigourney drill. The Niles Tool Works Co. sold two 48-in. car wheel borers to a railroad in the Middle West.

SOUTHERN DISTRICT

Machinery and machine tool business in the South which had been rather slow for the month or two prior to the election, has since then been improving a little, though as a whole is still quiet and with most distributors not as heavy as at this time last year. The outlook, however, seems more promising, judging from the volume and tone of present inquiries, and some of the larger buyers are expected to place orders during the next few weeks for their wants the early part of 1929.

In the woodworking machinery field distributors say that while business is much less than it was at this time last year it is approximately on a normal basis, for the furniture industries in the Southeast are buying fairly well, while lumber and sawmills, expecting to close for a time during the holidays and overhaul their plants, also are placing some orders. In the textile field business also continues brisk, and the outlook for this field the next six months is unusually good as the industry is now doing considerable construction in the Southeast, or plans starting such construction early in 1929. In the railroad field a few orders of some size have also been placed recently, and the outlook in that field is also considered good.

Smaller machine shops and garages are buying hardly anything right now, and such purchases as they are making are for used or rebuilt equipment, as has been the case for several months past.

Another item that promises to be in heavy demand the first few months of 1929 is road building machinery and equipment, and present indications are that this type of equipment will be a good seller in all southeastern states.

Survey Shows That Research Pays

The Division of Engineering and Industrial Research of the National Research Council recently conducted a survey in which 797 of the 800 replies received from manufacturers indicate their belief that research pays. In addition to research by government bureaus, educational institutions, trade associations, and special groups in an industry co-operating on a definite research job, 68 per cent of these manufacturers maintain private laboratories. Over one-third of these are working to improve the quality of products and service to customers, on the assumption that reduced production costs will follow; 25 per cent of them toward the development of new fields of application; and 15 per cent to discover by-products and new materials.

According to the report of this survey in *Factory and Industrial Management*, for October, returns from leading manufacturers indicate that, excluding the automobile industry, on which figures are incomplete, the highest average annual research expenditures are $105,000, in the chemical and allied products industry, followed by $100,000 in the rubber and rubber products industry. The average research expenditures in percentage of capital invested are 2.4 for the chemicals and allied products industry, with metal-working plants holding second place with 2.1. Research expenditures by metal-working plants showed an increase of 200 per cent for 1927 over 1926, while a 100 per cent increase was reported for the paper and pulp industries.

British Motor Merger

An amalgamation of Humber, Hillman, and Commer motor interests was announced in London, England, on Nov. 20. The object is to obtain greater economy in general administration and in production methods, as well as improved facilities for pooling research and engineering knowledge, so as to bring the combination into a position comparable with American automobile manufacturers. The three companies employ between 8,000 and 10,000 persons. The new concern will be known as Humbers, Ltd., and will have a capital of $8,750,000, it is stated.

Increased Mechanization of Mines to Be Pushed

Creation by the American Mining Congress of a national committee on mechanized mining to conduct a five-year program for extension of mechanized mining methods in the anthracite and bituminous coal regions of the country was announced recently. It will embrace a survey of developments and possibilities in coal mine mechanization for the purpose of promoting safety, efficiency and economy in the production of coal. The movement has the support of prominent coal operators of more than twenty-one states who will act as state chairmen, assisted by district chairmen in the separate coal districts. In all, nearly 150 coal operators will be actively engaged in the work of the committee in stimulating the use of machinery in the production of coal. Dr. L. E. Young of Pittsburgh, vice-president of the Pittsburgh Coal Company, heads the committee as national chairman. Dr. Young is chairman of the mining and loading section of the National Standardization Division of the American Mining Congress.

Billings & Spencer Reorganization

Reorganization plans of the Billings & Spencer Co., Hartford, Conn., as proposed were voted November 19. Liquidation of the present company as recommended, was voted and incorporation papers were filed for the new company under the name of the B. & S. Company. After January 1st the company will resume the Billings & Spencer name again. Officers and directors of the new company were elected as follows: President, Frederick C. Billings; vice-president and general manager, A. H. Deute; secretary and assistant treasurer, Chas. T. Jones; chairman of the board, David J. Post; directors, Lucius F. Robinson, Nelson Smith, Edward Milligan, Richard J. Goodman, L. Edmund Zacher, Seth Hadfield, and the officers. Reorganization calls for the exchange of one class of stock. Preferred stockholders take a share of common stock of $10 in exchange and the right to subscribe for one share of new common stock in the ratio of 1½ to 1. All stockholders participate in a stock dividend of one share for each five shares subscribed making the net $8.33⅓ a share.

Business Items

The Federal Products Corporation, of Providence, R. I., has changed its address to 1144 Eddy St. This is the third expansion the company has made in seven years.

The Boye & Emmes Machine Tool Co., of Cincinnati, has appointed the Camm-Blades Machinery Co., 610 Michigan St., Milwaukee, Wis., agent for the company's line of lathes in that territory.

The Smith & Mills Co., of Cincinnati, Ohio, has appointed Knickerbocker, Cram & Co., Inc., 7 E. 42nd St., New York, N. Y., as agents for the company's shapers in the New York City territory.

The Sandow Brass Products Co., Inc., Jersey City, N. J., has been incorporated with $300,000 preferred shares and 25,000 shares of no-par value stock by the United States Corporation Co., New York.

The Wagner Electric Corporation, of St. Louis, Mo., has moved its Los Angeles branch office and service station to larger quarters at 1220 Hope St. because of the increase in business in that territory.

The Gilbert J. Scofield Co., manufacturer of paper mill machinery, Albany, N. Y., will move its plant from 683 Broadway to the building formerly occupied by the International Harvester Co. on North Pearl St. A 5-year lease has been signed.

The Botfield Refractories Co., Philadelphia, Pa., manufacturer of "Adamant" fire brick cement and other refractory mixtures and the Adamant gun, announces that the Marshall Supply Co., Inc., operating in Pittsburg, Kansas and Tulsa, Okla., has been appointed distributor of its products.

The Fosdick Machine Tool Co., of Cincinnati, Ohio, announces that it has appointed Knickerbocker, Cram & Co., Inc., 7 East 42nd St., New York, N. Y., as its agents in the New York territory for the company's line of radial drills, upright drills and high-speed sensitive drills.

Machinery was recently installed by the Sterling Woods Products Co. in the remodeled plant of the W. J. Oliver Manufacturing Co., in Knoxville, Tenn. The plant will manufacture wood automobile parts. It was operated as a shell plant during the war.

The Albany Steam Trap Co., Albany, N. Y., has been sold to Harry C. Bantham and Reginald C. Pepper of the Capitol Pat-

tern Co., 73 Livingston Ave., Albany. The identity of the Albany Steam Trap Co., which was founded in 1871, is to be continued, and the plant of the pattern firm will be moved to the Steam Trap company's building.

The American Electric Switch Corporation, of Minerva, Ohio, has appointed G. E. Lindstrom as direct factory representative in the Metropoitan district, his headquarters being at 430 E. 53rd Street, New York City. The firm of Holland & Monaghan has been discontinued as representative.

The Equipment Corporation of America, with factory at Chicago Heights, Ill., has become consolidated with the Construction Machinery Co., Waterloo, Iowa, making the latter firm one of the largest manufacturers of concrete mixers in the United States.

Resumption of operations will shortly take place at the Sorg Engine Co., near Tuscumbia, Ala., it was announced, following the election of officers and the appointment of C. H. Klinger as manager of operations. W. A. Sorg remains president of the company; W. J. Phinn, vice-president; and Frank MacLanathan, treasurer. Mr. Klinger is secretary.

Material commitments for the first quarter of 1929, for materials and parts used in the manufacture of engines to the extent of $2,500,000, has been made by the Lycoming Manufacturing Co., a subsidiary of the Auburn Automobile Co., Auburn, Ind. This figure represents the largest single material release in the history of the company.

The Keystone Aircraft Corporation and the Loening Aeronautical Engineering Corporation, announced the merger of the two companies. Both the Loening plant at 31st St. and East River, New York City, and the Keystone plant at Bristol, Pa., will continue to operate as at present. In addition to military types, a complete line of commercial cabin amphibians and tri-motored overland transports will be produced.

The Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago, Ill., manufacturer of Thor pneumatic and electric tools, will build an addition to its factory in Aurora, Ill. The new structure, which will be made of fire-proof concrete construction, will add 36,000 sq.ft. to the present capacity. The plans have been approved, and work will commence in the near future.

All factory employees of Deere & Co., Moline, Ill., will be given two-weeks vacation with pay, it was announced last week by the board of directors, the order affecting 4,500 employees in the tri-city shops and 2,500 others in branch factories of the company. Every worker, two years in service of the company, is entitled the vacation, the pay dependent upon his regular wage and length of service.

An expansion program, involving an expenditure of $750,000, was announced last week by the Monarch Tractors Co., Allis-Chalmers subsidiary in Springfield, Ill., which will provide new buildings doubling the factory floor space of 68,000 sq.ft. and resulting in production more than double the present output. To provide for this improvement, the Monarch Tractors has acquired 310 acres of land south of its present plant and the new plant will be equipped to produce a new smaller tractor which will be introduced next year.

Employees of the Studebaker Corporation of America in South Bend, Ind., earned $2,508,000 more in wages during the first ten months of 1928 than during the same period of last year. The payroll in South Bend alone had reached a total of $16,724,000 up to Nov. 1. In annoucing the increase, officials of the corporation promised that employees in that city will receive an even greater amount next year, when the transfer of several departments from Detroit is completed. The reorganization will include transfer of the engineering and manufacturing offices from Detroit, concentration of the service and spare parts department in South Bend. As soon as present plant alterations are completed, the company plans to employ more than 16,000 men in South Bend.

The Scott-Witter Steel Corporation, Hartford, Conn., has been chartered with a capital of $575,000 and has purchased the plant formerly occupied by the Connecticut Electric Steel Co. John D. Scott, heads the new corporation, which will continue to manufacture the quality castings of carbon and alloy steels. The concern also proposes to install machinery for the production of tire mold made of a thin shell of alloy steel in which are cast the intricate tread designs by the use of an electric process. Other officers of the Scott-Witter corporation are: Vice-president, Claude L. Witter; secretary and treasurer Albert W. Gray of the Hartford Electric Light Co. Frederick L. Hewitt, formerly vice-president of the Hanson-Van Winkle-Munning Co., New York, is chairman of the board of directors and the following are directors: B. J. Baker, of B. J. Baker & Co., Boston; Samuel Ferguson, president of the Hartford Electric Light Co.; A. P. Munning of the Hanson-Van Winkle-Munning Co., New York, and George I. Stanford, Milford.

Personals

JOSEPH B. CONLEY, formerly general foreman of the Lorain (Ohio) yard of the American Shipbuilding Co., has been appointed assistant superintendent.

H. G. FREELAND, formerly with the Federal Bearings Co., Poughkeepsie, N. Y., is now representing the Atlas Steel Corporation of Dunkirk, N. Y., in the state of Connecticut.

WILLIAM H. FRENCH, formerly general foreman of the De Laval Separator Co. of Poughkeepsie, has recently accepted a position as superintendent of the Graham & Norton Co. of New York City.

HERBERT W. STONE, formerly vice-president and general manager of the U. S. Hoffman Machine Corporation of New York, has been elected president to succeed the late Eugene D. Stocker.

GEORGE H. ACKROYD, superintendent of the Saucon roll shop of the Bethlehem Steel Corp., Bethlehem, Pa., is now superintendent of the steel foundry, iron roll foundry and machine shop at the Bethlehem plant.

R. L. CAWOOD, president of the Patterson Foundry & Machine Co., East Liverpool, Ohio, has been elected president of the Patterson Welding & Repair Co., of the same place.

W. M. GARRIGUES has been appointed general sales manager of the Central Alloy Steel Corporation, Massillon, Ohio. He has been assistant general manager of sales for the past seven years.

D. J. STERRETT, formerly chief engineer of the Russell Wheel & Foundry Co., now the Russell Steel Construction Co., has been elected vice-president and general manager in place of C. W. Russell, resigned.

FRED A. GEIER, president of the Cincinnati Milling Machine Co., Cincinnati, Ohio, was the principal speaker at a meeting of the Foreman's Club of Cincinnati, held on Nov. 20. He compared standards of living in this country with those of Europe.

A. M. RITCHIE, operating superintendent of the Northern Electric Co., Ltd., Montreal, Que., was recently presented with a silver salver in recognition of his 50 years of service with the company. Mr. Ritchie had been in the telephone manufacturing business since its inception and helped build Bell's first telephone.

HERBERT LUCIUS WHITTEMORE, chief of the engineering mechanics section of the Bureau of Standards, was awarded the James Turner Morehead medal at the annual convention of the International Acetylene Association, held in Chicago, Nov. 14. The award was made for his outstanding welding research work in the oxyacetylene field.

LEWIS S. BOWMAN, Indiana state auditor for the last term, is to begin his active duties as secretary of the Perfect Circle Co., at Hagerstown, Ind., Dec. 1. The company manufactures piston rings. Mr. Bowman became associated with the company last July. The corporation maintains factories also at Newcastle and Tipton, both in Indiana.

T. E. DAVIS has been elected president of the Caldbeck Tool and Manufacturing Co., of Des Moines, Ia., in place of Wendell H. Caldbeck, deceased. R. J. Bennet is vice-president and general manager, Edith Caldbeck, treasurer, and K. H. Peterson, secretary.

H. N. FELTON, formerly branch manager of the St. Louis office of the Wagner Electric Corporation, has been made branch manager of the New York office. T. F. COUP, formerly in charge of the Cincinnati office, has been moved to the Milwaukee office as branch manager. PAUL FORSYTH has been appointed manager of the Cincinnati office.

DR. WHEELER P. DAVEY, professor of physical chemistry at the Pennsylvania State College, will present the Robert Henry Thurston lecture on Thursday, December 6, in the auditorium of the Engineering Society Building, New York City, during the annual meeting of the American Society of Mechanical Engineers. His subject will be "The Elastic Properties of Materials as Shown by Crystal-Structure Investigations."

COL. FRANK A. SCOTT, chairman of the board of the Warner & Swasey Co., Cleveland, and retiring chief of the Cleveland Ordnance District, was honored recently upon the occasion of his retirement from the Army for "pre-eminent service in war time and in peace." During the war, Colonel Scott headed the General Munitions Board until his health broke down. Brig. Gen. Colden L'H. Ruggles presented the Army's official resolution of regret in the form of a parchment document.

BARNEY G. TANG, assistant general superintendent of the Schenectady Works of the General Electric Co., has been made general superintendent to succeed James A. Smith, who died October 25. John D. Harnden, former superintendent of the testing department, has been appointed assistant to the works manager, F. L. Kemp succeeding him as superintendent of the testing department, and LeRoy Beers has been made plant engineer, a newly-created position under the works manager. Mr. Tang came to the Schenectady Works in 1898. He worked in the searchlight and switchboard departments, switch department and tool room where he was a subforeman. He was then made superintendent of a plant section. His appointment as general superintendent takes effect immediately.

Obituaries

STRICKLAND L. KNEASS, 67, vice-president of Wm. Sellers & Co., Philadelphia, Pa., died on Nov. 25 after a brief illness. He was an inventor and was particularly known for an injector which he devised for locomotive boilers. He was twice awarded the John Scott Medal of the Franklin Institute. He was also a wide writer in engineering journals.

GEORGE W. BROWN, vice-president and one of the founders of the United Shoe Machinery Co., died in Boston on Nov. 16. He had been one of New England's most active business men up to two years ago. He was at one time treasurer of the Consolidated McKay Lasting Machine Co. and was also general manager. He was also a director of the British and the French United Shoe Machinery Companies and was chairman of the finance committee of the American branch.

Forthcoming Meetings

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York, week of Dec. 3. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

Seventh National Exposition of Power and Mechanical Engineering. Held at Grand Central Palace, New York, N. Y., week of December 3.

Power Transmission Association. Annual meeting, Hotel Commodore, New York City, Dec. 6. Association headquarters, 644 Drexel Bldg., Philadelphia.

Western Metal Congress and Western States Metal & Machinery Exposition. Held in Los Angeles, Jan. 14-18, under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

The Weekly Price Guide

Rise and Fall of the Market

SCRAP metals continue to decline in the face of advancing trends in new material. In the commodities listed herewith, price changes of the week were upward in black steel sheets, pig iron, tin, fabricated brass and copper, wiping cloths and linseed oil. Declines were confined to non-ferrous metal scrap of various descriptions. The most important rise of the week was that which occurred in tinplate. This material advanced $2 per ton, to $5.35 per base box, Pittsburgh. Steel production is tapering off gradually with seasonal decline in demand. Fabricated structural steel sales for October, computed by the Dept. of Commerce, totaled 240,000 tons, against 318,750 in September and 288,750 tons for October, 1927. Demand, on the other hand, is notably active in plates, pipe, rails and railway material. Iron prices are now made firmer by low stocks at furnace yards.

(All prices as of Nov. 23, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	25.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	16.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	22.26
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4 50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35	3.25	3.90*
No. 12	2.05@2.15	3.40	3.30	3.95*
No. 14	2.15@2.25	3.45	3.35	4.00*
No. 16	2.25@2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.55@2.65	3.60	3.30	4.00
No. 22	2.70@2.80	3.75	3.45	4.15
No. 24	2.75@2.85	3.80	3.50	4.20
No. 26	2.85@2.95	3.90	3.60	4.30
No. 28	3.00@3.10	4.05	3.75	4.45
Galvanized				
No. 10	2.70@2.80	3.95	3.65	4.25
Nos. 12 to 14	2.80@2.90	4.05	3.75	4.35
No. 16	2.90@3.00	4.15	3.85	4.45
No. 18	3.05@3.15	4.30	4.00	4.60
No. 20	3.20@3.30	4.45	4.20	4.75
No. 22	3.25@3.35	4.50	4.25	4.80
No. 24	3.50@3.60	4.65	4.35	4.95
No. 26	3.65@3.75	4.90	4.60	5.20
No 28	3.90@4.00	5.15	4.85	5.45

250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
¼	$0.17	1.315	1.049	.133
⅜	.23	1.66	1.38	.14
½	.27½	1.9	1.61	.145
¾	.37	2.375	2.067	.154
1	.58½	2.875	2.469	.203
1¼	.76½	3.5	3.068	.216
1½	.92	4.0	3.548	.226
2	1.09	4.5	4.026	.237
2½	1.27	5.0	4.506	.247
3	1.48	5.563	5.047	.258
4	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	Thickness—B.w.g. and Fractions	Outside Diameter in Inches—¼	⅜	½	⅝	1	1⅛	1¼
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; ⅛, 7.85c.; $\frac{5}{32}$ to ¼, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			16.75
Tin, Straits, pigs, New York			52.00
Lead, pigs, E. St. Louis	6.20	New York	8.00
Zinc, slabs, E. St. Louis	6.25	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	13.50	14.00	14.25
Copper sheets, base	25.00	25.00	25.00
Copper wire, base	21.62½	21.25	17.87½*
Copper bars, base	23.50	23.50	24.00
Copper tubing, base	26.37½	26.37½	26.37½
Brass sheets, high, base	20.50	20.50	20.50
Brass tubing, high, base	25.37½	25.37½	25.37½
Brass rods, high, base	18.25	18.25	18.25
Brass wire, high, base	21.00	21.00	21.00

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	25.00*	24.30	24.30
Zinc sheets (casks)	10.00@10.50	11.00	10.11
Solder (½ and ½)	35.75	33.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade			69.25
Commercial genuine, intermediate grade			53.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.25
Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:			
Ingots 35.00	Electrolytic 37.00	Shot 36.00	

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled nickel rods, Grade "A" (base)	45.00
Cold drawn nickel rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper	14.00 @14.25	13.75	12.75@13.25
Copper, heavy, and wire	13.25 @14.00	13.00	12.12½@12.50
Copper, light, and bottoms	12.00 @12.37½	11.00	11.00@11.50
Heavy lead	5.00 @ 5.25	6.25	4.75@ 5.25
Tea lead	3.37½@ 3.87½	4.25	3.75@ 4.25
Brass, heavy, yellow	7.75 @ 8.00	8.50	8.00@ 8.50
Brass, heavy, red	10.75 @11.25	....	10.25@10.75
Brass, light	6.25 @ 6.75	6.75	6.75@ 7.25
No. 1 yellow rod turnings	9.00 @ 9.50	9.50	8.75@ 9.25
Zinc	3.25 @ 3.50	3.25	3.00@ 3.50

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—8-lb. Coating—Small lots—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb	.16@.16½	38.00 per M	.17
Sal soda, per lb	.02	.02	.02
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb	.112	.11	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30–5%	30–5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	50%	50–10%	50%
Second grade	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.0325	$0.0325	$0.0324
Cold drawn shafting	per lb	.034	.034	.04
Brass rods	per lb	.1825	.175	.16
Solder (½ and ½)	per lb	.3575	.3425	.3575
Cotton waste, white	per lb	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No 1, 6-in. dia	per 100	3.59	3.59	3.10
Lard cutting oil	per gal	.65	.65	.65
Machine oil	per gal	.30	.30	.27
Belting, leather, medium	off list	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper	$4.05	$4.29	$4.29
Emery cloth	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper	2.04	2.04	2.04
Cloth	3.59	3.59	3.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.85@3.00
Coke, prompt foundry, per net ton	Connellsville,		4.00@4.50
White lead, dry or in oil	100 lb. kegs	New York,	13.25
Red lead, dry	100 lb. kegs	New York.	13.25
Red lead, in oil	100 lb. kegs	New York,	14.75

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1¼ and 1½ in. dia.	35%
Carriage bolts:	
Up to ¾ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ¾ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including $\frac{7}{16}$-in. dia	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Ind., Anderson—Forse Mfg. Co., 14th and Sheridan Sts., c/o H. D. Forse—recently organized for the manufacture of machinery for dry cleaning plants, capital $100,000. Will purchase machinery and equipment.

Ind., Anderson — Grable Regulator Co., 3rd and Sycamore Sts.—machinery and equipment for the manufacture of gas regulators for proposed 30 x 100 ft. plant.

Mass., Boston—Box 218, Astor Station—milling attachment for 9 in. drill.

Mass., Chelsea (Boston P. O.)—Everett Ave. Auto Parts Co., 234 Everett Ave.—tools and equipment for proposed 1 story, 45 x 100 ft. machine shop.

Mich., Detroit—R. C. Alexander, 19207 Charleston Ave.—complete machine shop equipment.

Mich., Detroit—Atwater Electric Co., Inc., 2675 Atwater St.—machine shop equipment for repair and rebuilding of electric motors.

Mich., Detroit—Timken Detroit Axle Co., Clark St. — miscellaneous machine shop equipment (later) for proposed 2 story auto body factory. Estimated cost $50,000.

Mich., Detroit—Victory Machine & Tool Co., 5259 Western Ave.—planer.

Mich., Detroit—Winter & Kauffman, 1521 Michigan Ave.—(auto repair and machine work)—cylinder reborer and grinder.

Mich., Flint — Crane Co., 150 Randolph St., Detroit—equipment for handling and fitting pipe for proposed 1 story, 105 x 105 ft. shop and warehouse. Estimated cost $50,000.

Mich., Muskegon—American Coil Spring Co., Nims St.—equipment for the manufacture of coil springs.

Mich., St. Joseph—Robinson Marine Construction Co., 227 West Main St.—miscellaneous machine shop equipment for proposed 50 x 60, 50 x 100 and 80 x 180 ft. boat building plant. Estimated cost $60,000.

N. Y., Brooklyn—Bd. of Education, 500 Park Ave., New York—will receive bids late in December for machine shop equipment to cost $10,000 for Williamsburg Continuation School.

N. Y., Sackets Harbor—Lakeside Country Club, F. Switzer, Res. Engr.—toolmakers lathe and drill press.

O., Cleveland Heights—Bd. of Education, W. G. Nesbit, Dir.—machinery and equipment for shop and manual training departments for proposed 3 story high school on Yellowstone Rd. Estimated cost $350,000.

S. A., Cali, Columbia—Baldwin Locomotive Works, 500 North Broad St., Engrs. and representing owners—are receiving bids for machine shop tools, machinery, etc., to cost $2,000,000, for proposed locomotive repair shops at Cali, Columbia, S. A.

Opportunities for Future Business

Colo., Denver—Baker Oil Burner Co., M. H. Block, Mgr., Pueblo, manufacturers of home heating oil burners, is having plans prepared for the construction of a plant, here.

Colo., Pueblo—City, J. W. Carpenter, Clk, plans the construction of a machine shop at City Hall Pl. and South Main St. D. P. Gaymon, City Engr.

Conn., Middletown—Wilcox, Grottenden & Co. Inc., 3 South Main St., is receiving bids for the construction of a foundry. Estimated cost $40,000. Lockwood, Greene & Co., 100 East 42nd St., New York, N. Y., Engrs.

Ill., Chicago—Griffith Laboratories Co., 1415 West 37th St., manufacturers of bakers' supplies, awarded contract for a 2 story, 76 x 115 ft. factory at 4103 South La Salle St. Estimated cost $50,000.

Ill., Rock Island—International Harvester Co., 606 South Michigan Ave., Chicago, Ill., awarded contract for the construction of a 2 story, 88 x 550 ft. plant, here.

Ill., South Chicago (Sta. Chicago) — Youngstown Sheet & Tube Co., J. A. Campbell, Pres., is having plans prepared for the construction of four additional open hearth furnaces and two bar mills to increase capacity of steel plant here. Private plans.

Ind., East Chicago — American Steel Foundry Co., 410 North Michigan Ave., Chicago, Ill., awarded contract for the construction of a 1 story, 75 x 100 ft. foundry here. Estimated cost $40,000.

Ind., Evansville—Graham Bros., Stringtown Rd., awarded contract for the construction of a 1 story factory. Estimated cost $250,000. Noted Nov. 15.

Ind., Fort Wayne — C. R. Wermuth & Sons, 1036 St. Marys St., awarded contract for a 1 story, 72 x 108 ft. machine shop at Pontiac St. Estimated cost $40,000.

Md., Baltimore—Lockwood, Greene & Co., 400 North Michigan Ave., Chicago, Ill., Archts. and Engrs., will soon receive bids for a 2 story, 140 x 180 ft. factory for the manufacture of bakers' utensils (pans, etc.) tools and machinery here, for E. Katzinger & Co., 1949 North Cicero Ave., Chicago, Ill. Estimated cost $200,000.

Md., Baltimore—Western Electric Co., E. S. Bloom, Pres., 195 Broadway, New York, N. Y., subsidiary of American Telephone & Telegraph Co., awarded contract for the construction of a telephone cable factory, here. Estimated cost approximately $15,000,000. Noted Nov. 15.

Mass., East Pepperell—Cornell Multi-Wall Valve Bag Co., Chicago, Ill., awarded contract for a 1 story, 100 x 160 ft. factory here.

Mass., New Bedford—Allen Co., 136 River Rd., will build a 1 story addition to woodworking plant. Private plans.

Mich., Detroit—City is having plans prepared for extensions and improvements to airport including hangars, shops, etc. Estimated cost $5,000,000. P. A. Fellows, City Hall, Engr.

Mich., Detroit—Lane, Davenport & Peterson, Charlevoix Ave., Engrs., will receive bids about Dec. 10 for the construction of a 1 story, 120 x 125 ft. factory on Woodrow Wilson Ave. for Gorham Tool Co., 2206 12th St.

Mich., Detroit—Donaldson & Meier, 1188 First National Bank Bldg., Archts., will receive bids about Dec. 3 for a 2 story, 86 x 120 ft. factory for the manufacture of outboard marine motors at Second and Amsterdam Aves. for Caille Bros. Second and Amsterdam Aves. Estimated cost $55,000.

Minn., Minneapolis — Diamond Iron Works, 18th Ave. N. and Second St., plans the construction of a foundry and machine shop at 18th Ave. and Second St. Estimated cost $150,000. Architect not announced.

N. H., Walpole—American Mineral Products Co., Inc., awarded contract for a 1 story, 60 x 230 ft. feldspar grinding plant on Gold River. Estimated cost $160,000.

N. J., East Camden—Bd. of Education, Camden, will receive bids until Dec. 7 for the construction of a new high school including electric and woodworking shop, etc. here. Davis, Dunlay & Barney, 1805 Walnut St., Philadelphia, Pa., Archts.

N. J., Hillside—Lionel Corp., 605 South 21st St., Irvington, awarded contract for a 1 and 2 story factory for the manufacture of toy trains here. Estimated cost $140,000. Noted Sept. 20.

N. J., West New York—Brinkerhoff Electric Co., c/o Lockwood, Greene & Co., 100 East 42nd St., New York, Engrs., awarded contract for a 3 story, 70 x 180 ft. factory at 11th St. and Scheley Pl., here. Estimated cost $75,000. Noted Oct. 18.

N. Y., Brooklyn—Weihl Bros., 971 Grand St., is receiving bids for the construction of a foundry at Grand St. and Morgan Ave. Estimated cost $25,000. T. Goldstone, 26 Court St., Archt. Noted Nov. 8.

O., Cleveland—Bd. of Education, F. G. Hogen, Dir., will soon award contract for the construction of a 1 story foundry on Eagle Ave. Estimated cost $45,000. G. M. Hopkinson, Auditorium Garage Bldg., Archt. Noted Nov. 1.

O., Cleveland—Kelly Reamer Co., E. W. Putnam, V. Pres. and Gen. Mgr., 3705 West 73rd St., awarded contract for a 1 story, 60 x 200 ft. addition to factory for production of tools and reamers. Estimated cost $60,000.

O., Cleveland—Lamson & Session Co., 1971 West 85th St., manufacturers of bolts and nuts, are having plans prepared for the construction of a 4 story addition to factory at West 85th St. and Franklin Ave. Estimated cost $75,000. George S. Rider Co., Century Bldg., Archt.

O., Dayton—Ballinger Co., 12th and Chestnut Sts., Philadelphia, Pa., Archts., will receive bids until Dec. 4 for the construction of a 1 story, 165 x 485 ft. plant here for Leland Electric Co., 218 North St. Clair St., Dayton, O.

O., Elyria—The Cleveland Automatic Machine Co., H. W. Ruppel, Gen. Mgr., 2269 East 65th St., Cleveland, plans the construction of a factory here. Estimated cost $150,000. Architect not announced.

Pennsylvania—Buffalo, Rochester & Pittsburgh Ry. Co., 36 Wall St., New York, is having plans prepared for the construction of a car repair shop in either Bradford, Du Bois, or Punxsutawney here. Estimated cost $500,000. E. F. Robinson, Rochester, Ch. Engr.

Pa., North Wales—Baily Mfg. Co., 2336 Vine St., Philadelphia, manufacturers of automobile bodies, will soon receive bids for a 1 story, 50 x 200 ft. plant here. L. W. Levin, 1011 Chestnut St., Philadelphia, Archt.

Pa., Philadelphia — Ajax Metal Co., 46 Richmond St., smelters and refiners) awarded contract for a 2 story, 52 x 56 ft. shop at 1108-12 Frankford Ave.

Pa., Philadelphia — National Umbrella Frame Co., Belfield and Penn Sts., awarded contract for a 2 story, 60 x 183 ft. plant. Estimated cost $60,000.

Pa., Philadelphia—Thomas Halton & Son, Mascher and Oxford Sts., will soon award contract for a 1 story, 69 x 241 ft. machine shop at Clearfield and C. Sts. W. E. S. Dyer, Land Title Bldg., Engr.

Tex., El Paso—Phelps-Dodge Corp., c/o Chamber of Commerce, will build a copper refining mill. Estimated cost $5,000,000.

Ont., Milverton — Honderich Furniture Co., plans addition to furniture factory. Estimated cost $50,000. Architect not announced.

Ont., Mount Denis — Firstbrook Bros. Boxes Ltd., 283 King St. E., Toronto, awarded contract for the construction of a 2 story, 160 x 320 ft. box factory and 1 story 100 x 380 ft. warehouse, etc. Estimated cost $350,000. Noted Aug. 23.

Ont., Toronto—Cozens Spring Service, 4 Wood St., awarded contract for the construction of a 2 story, 50 x 102 ft. automobile spring plant on Queen St. E. Estimated cost $75,000.

Ont., Toronto—Mundet Cork & Insulation Ltd., 51 St. Lawrence St., awarded contract for a 1 and 2 story, 100 x 150 ft. factory at ft. of Booth Ave. Estimated cost $100,000.

Ont., York—Riley Engineering & Supply Co., 360 Dufferin St., Toronto, plans the construction of a 1 and 2 story factory for the manufacture of steam power plant equipment on Sidney St., here. Estimated cost $75,000 to $100,000. Private plans.